ELECTRICAL SOUTH

SEPTEMBER
1943

UNIVERSITY OF FLO

FANS by HUNTER CENTURY

55th SEASON

52-In Hotel Type

24-In "Airspread" Ceiling

HUNTER, who has made fans and ventilators exclusively during 55 years, is now operating under War Production Board restrictions. • No more fans will be made except for the Army, Navy and Maritime Commission. • HUNTER unfilled orders now on hand represent contracts with Government Agencies. • Certain sizes of belted exhaust types can be made available for Government hospitals and other war industries, subject to limited material inventories now on hand.

HUNTER FAN & VENTILATING COMPANY, INC.

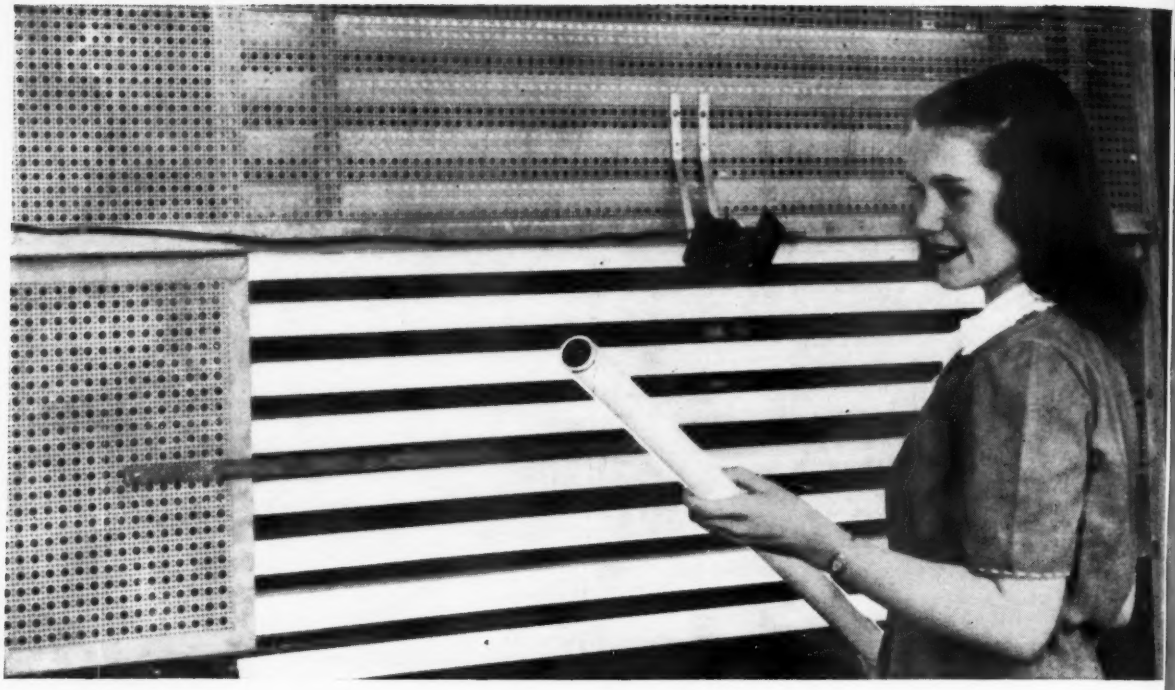
Factory: FULTON, N. Y.

General Sales Offices: Memphis, Sterick Bldg. *Eastern Sales Office:* New York, 92 Warren Street *Western Sales Office:* St. Louis, 1706 Olive Street

Sales Offices:
ATLANTA
CHICAGO
DALLAS
HOUSTON
LOS ANGELES
PHILADELPHIA

Zephair Comfort Cooling and Commercial Ventilators

Sales Offices:
BOSTON
CLEVELAND
DETROIT
KANSAS CITY
NEW ORLEANS
PITTSBURGH



AGE BEFORE DUTY..

● When properly "aged" or seasoned, fluorescent lamps remain more constant than daylight throughout their entire life. This is important in lamps that illuminate precision work in war plants.

At Sylvania there is a special "age before duty" machine that lights and relights fluorescent lamps for carefully regulated time intervals. This mellowing process prepares all the elements that make up a lamp for a life of uniform light output. It is also a final precaution taken to weed out an occasional substandard lamp which may have filtered through dozens of painstaking inspections.

That is why a Sylvania Fluorescent Lamp can be counted on for consistent light output every minute of its life.

"Aging" is one of many Sylvania methods of safeguarding fluorescent quality. Lamp efficiency is perfected and maintained at its highest peak through continual research by Sylvania engineers who have years of specialized experience with incandescent lamps, radio tubes, ultra-violet lamps and other electronic devices.

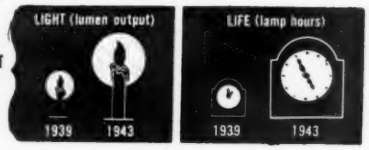
Today Sylvania's research is providing the best and most economical lighting known for war industry. When victory is won, the same independent research will bring the advantages of fluorescent lighting to postwar homes.

For more light output, longer life and uniform color, specify Sylvania Fluorescent Lamps in new installations and replacements.

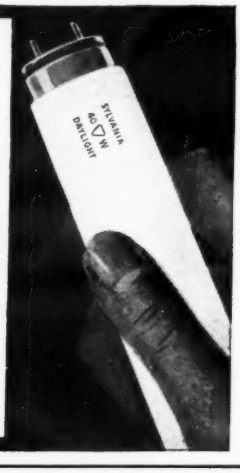
SELL SYLVANIA AND GIVE YOUR CUSTOMERS FAR MORE LIGHT AND LIFE FOR THEIR MONEY

Compared with 1939, a dollar invested today in Sylvania Fluorescent Lamps buys more than four times the lumen output and approximately five times the lamp life.

SYLVANIA FLUORESCENT DOLLAR BUYS:



(Based on decreasing price and increasing efficiency and durability of Sylvania 40-Watt White Fluorescent Lamp)



SYLVANIA

ELECTRIC PRODUCTS INC.

Formerly Hygrade Sylvania Corporation

Salem, Mass.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES

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Volume 23 Number 9

let's break it down...

We've only been knocking at that door . . . Midway . . . Guadalcanal, Attu, Buna, Munda . . . Tunisia, Pantelleria, Sicily. . . .

Magnificent actions all . . . but only steps that have brought us to the threshold of Victory.

Now it's here. *Invasion!*

But we've got to back these fighters with a fighting home front.

The 3rd War Loan Drive is on. The quota is $15,000,000,000.

The United States Government is asking you to invest in at least an *extra* $100 bond during September. But the job doesn't end there. We've got to get our family, friends and fellow employees to invest in their share of these victory-producing bonds and back the attack that has brought us this far.

Remember, this is what we've been waiting for. This is *invasion!*

back the attack with war bonds!

HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE CO., WILKES-BARRE, PA.
Insulated wires & cables for the electrical industry

LOOK WHAT'S HAPPENED TO

SINCE G-E MADE THIS ANNOUNCEMENT

FACTS YOU SHOULD KNOW ABOUT NON-METALLIC REFLECTORS

for Fluorescent Fixtures!

EFFICIENT NEW REFLECTORS RELEASE TONS OF STEEL FOR OTHER WAR PRODUCTION

INTENSIVE work by the lighting industry now has developed non-metallic reflectors for fluorescent lamp fixtures. They are efficient, light in weight and built to stand up under hard usage in industry.

No more steel reflectors may be manufactured except for dust-tight and vapor-proof units. Realizing the need to conserve metal, lighting engineers have been working for almost a year to find alternate reflector materials. They have succeeded. General Electric is proud to have been able to contribute to the research that has made these efficient new reflectors possible.

There have been, of course, many experiments with non-metallic reflectors. To make certain that the reflectors on the fixtures you get will give uniformly satisfactory service . . . that they will be strong and durable . . . you will find it advisable to buy tested and certified fixtures. Look for the Fleur-O-Lier or RLM label!

"SPECIFICATIONS FOR LUMINAIRES, FITTINGS AND AUXILIARIES FOR FLUORESCENT LAMPS"
ELECTRICAL TESTING LABORATORIES
NEW YORK, N. Y.

G-E MAZDA LAMPS

GENERAL ELECTRIC

FLUORESCENT LIGHTING . . .

RESTRICTIONS which WPB has established on the use of metals in fluorescent fixtures have been a challenge to the lighting industry. A challenge which the industry was more than ready to meet, but which presented almost insurmountable difficulties—coming as it did along with an acute shortage of lighting equipment for important war plants.

Long before the first WPB order, General Electric engineers had been working with fixture manufacturers to develop new fixtures using a minimum of critical materials. Last January, G-E announced that several types of non-metallic reflectors had been developed. Today, thanks to the ingenuity of the fixture manufacturers, a large selection of certified fluorescent fixtures, complying with WPB requirements and meeting the lighting industry's rigid specifications, are now available on priorities for war plants that need them.

General Electric is proud of its share in this achievement—and G-E research will continue to work with fixture manufacturers toward making better and better lighting fixtures—for the duration and afterwards.

Now... CERTIFIED FIXTURES ARE AVAILABLE FROM MANY MANUFACTURERS

LIGHT—STURDY CONSTRUCTION . . . FOR CONTINUOUS ROW OR INDIVIDUAL MOUNTING . . . 2 OR 3-LAMP TYPES IN 40-WATT SIZE—2-LAMP 100-WATT SIZE

Here are a few of the many different types of certified fluorescent fixtures available from the 50 Fleur-O-Lier and RLM Manufacturers through their wholesalers. All comply with WPB conservation orders and are made by manufacturers of ETL certified equipment. (*Names of these manufacturers on request.*)

General Electric does not make lighting fixtures but is glad to recommend certified fluorescent fixtures.

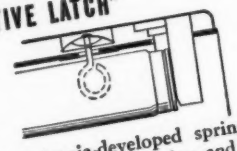
✱ *In process of certification when this advertisement goes to press.*

G-E MAZDA LAMPS

GENERAL ELECTRIC

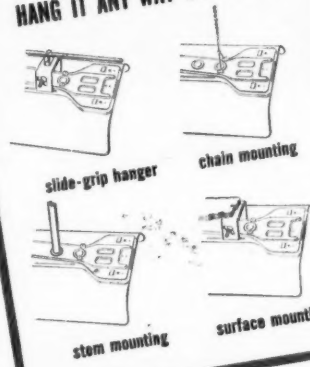
SYLVANIA *Challenge*

EXCLUSIVE "CAPTIVE LATCH"

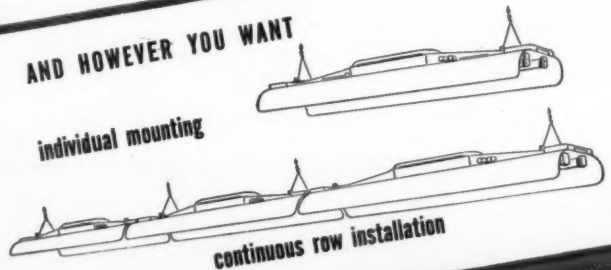


This Sylvania-developed spring-type fastener saves installation and maintenance man-hours. It stays put while lamp is in service despite any kind of vibration. It locks or unlocks with a simple quarter turn. No tools are necessary.

HANG IT ANY WAY YOU WANT



AND HOWEVER YOU WANT



MORE LIGHT FROM LESS WEIGHT

Sylvania pioneered composition reflectors for fluorescent fixtures and "proved them in industry."

This composition reflector has an efficiency of 86 per cent — even higher than that of prewar porcelain-enameled metal in conventional contours.

It is fabricated to Sylvania's specifications from a strong and durable composition. Coated with MIRACOAT inside and a handsome French Gray outside, it stands up under extreme humidity and temperature conditions.

- √ Impervious to frequent washing.
- √ Gives more light.
- √ Lighter and easier to handle.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTU

Check these points of Superiority

- √ Easier installation
- √ Speedier maintenance
- √ Cantilever construction
- √ Simple design
- √ Standard interchangeable parts
- √ Enclosed ballasts
- √ Single or continuous row hanging

The Fixture of the Future against the field

● Compare the design and construction of the Sylvania Fixture of the Future with any other fixture now available, and it wins hands down.

It is much more than a design to eliminate the metallic reflector and cut down top-housing weight to the three-pound requirement. Sylvania engineers attained a new standard of perfection, far ahead of its time.

A revelation of simplicity, this new Sylvania fixture is available in both 100-watt and 40-watt lamp size. In either length, *one* standard fixture fills any and all industrial lighting assignments.

Unparalleled in adaptability, it may be installed individually or in continuous rows. It is fitted with knock-outs for any practical mounting. The optional number of lamps in the regular 40-watt size gives new flexibility in meeting varying foot-candle requirements.

The streamlined top-housing, constructed like a cantilever bridge, encloses the ballast — protects it from dust — provides cooler performance. The starter sockets are honestly accessible — inset from the side to avoid dust, dirt and moisture. Pull-chain switch is optional.

The Sylvania Fixture of the Future carries Underwriters' Laboratories approval and our own standard guarantee. For specifications and prices, write Dept. ES-9, Sylvania, Ipswich, Mass.

"Everything that's Finest in Fluorescent"

★ ★ SYLVANIA ELECTRIC PRODUCTS INC.

LIGHTING DIVISION, IPSWICH, MASS.

ND ACCESSORIES, RADIO TUBES, ELECTRONIC DEVICES

WHEN OUNCES FEEL LIKE POUNDS...

*Reg. U. S. Pat. Office

1230 SIXTH AVENUE
ROCKEFELLER CENTER, NEW YORK 20

UNITED ST

DS...ASSAULT TROOPS USE LAYTEX*

You know how it is. You slog along all day under full equipment. At first you don't mind the weight very much. But as the hours crawl along, everything you're toting gets heavier and heavier. The canteen you didn't notice in the early stages now weighs as much as your rifle did then. And your rifle feels like a howitzer. Every ounce turns into a pound.

That's why . . . when you're moving fast and the going is tough . . . it's smart to use Laytex Assault Wire.

A full mile of Laytex Assault Wire weighs less than 30 pounds.

Laytex Assault Wire has a breaking strength of 50 pounds per conductor and a talking distance of more than 5 miles.

Laytex resists concussion and a wide range of temperature changes.

It is flexible and waterproof, strong and tough.

Conductors are accurately centered and the weight of insulation and the diameter of the insulated conductor are kept at the minimum.

All this adds up to the fact that one man, wearing a breast reel of Laytex Assault Wire can move swiftly and easily. One man can maintain sure communication with operational headquarters.

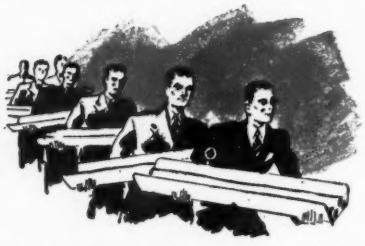
Listen to the Philharmonic Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

EDSTATES RUBBER COMPANY

"When it comes to warplant lighting . . . this label tells me what I want to know!"

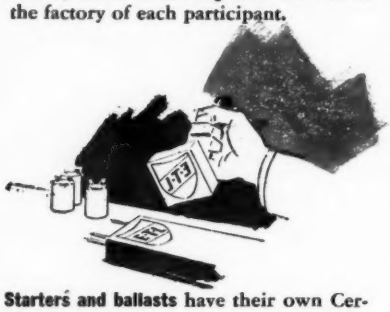
Certified
FLEUR-O-LIER
The Manufacturer guarantees by affixing this label that this Fluorescent Luminaire is a duplicate of samples found by periodic examination to comply with the minimum requirements as set up in the
"SPECIFICATIONS FOR LUMINAIRES, FITTINGS AND AUXILIARIES FOR FLUORESCENT LAMPS"
which are sponsored by the Manufacturers of Mazda Lamps.
Electrical Testing Laboratories, Inc.
NEW YORK, N. Y. 6-42
E-T-L
A COPY OF THIS CERTIFICATE SHOULD APPEAR UPON EACH UNIT OR PACKAGE
E-T-L
FLUORESCENT LIGHTING FIXTURES EMPLOYING EXISTING TYPES OF LAMPS ARE NOT RECOMMENDED FOR SCHOOLS, OFFICES AND SIMILAR LOCATIONS UNLESS LAMPS ARE SHIELDED FROM DIRECT VIEW

It saves a score of questions. It saves more scores of manhours and money in maintenance. And it can save production headaches. Because this label on a fluorescent lighting fixture means it's a FLEUR-O-LIER . . . TESTED—CERTIFIED—GUARANTEED!

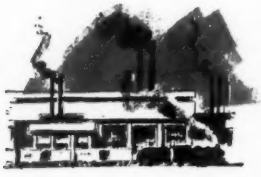


35 leading fixture makers participate in the FLEUR-O-LIER program . . . build their fixtures to rigid standards set up by Mazda lamp experts. Every single part of a FLEUR-O-LIER is tested to those standards, and Certified by impartial experts—Electrical Testing Laboratories, Inc., of New York—at the beginning.

Then checks are made at quarterly intervals by an E. T. L. inspector who visits the factory of each participant.



Starters and ballasts have their own Certification tests to make sure you get high power factor and reliable operation. The result? You don't have to test either the whole or any part of a FLEUR-O-LIER again. The LABEL tells you it's *right.*



FLEUR-O-LIERS conform to all WPB conservation orders. They're available only with suitable priority rating. Whenever warplant fluorescent is indicated, be sure to specify fixtures bearing the FLEUR-O-LIER label.

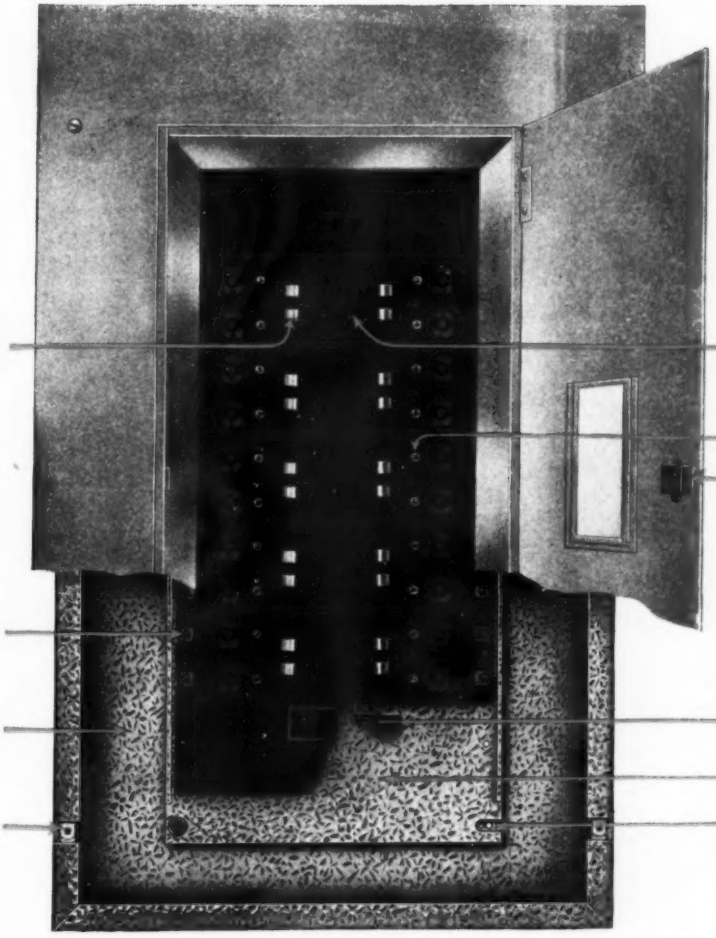
Write NOW for new booklet containing complete FLEUR-O-LIER engineering specifications. You'll want them for ready reference when you specify lighting equipment. With them you'll get the FLEUR-O-LIER story and list of manufacturers. Address FLEUR-O-LIER MANUFACTURERS, 2122-8 Keith Building, Cleveland 15, Ohio.

FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

This (FA) Lighting and Appliance Panelboard is *safety type* under all operating conditions


(FA) 30 Amp., S. P. Tumbler Switch with Bakelite Handle
(FA) Branch Circuit Wire Terminal Connector
Four-inch Wiring Gutter all around
(FA) Adjustable Trim Fastening Device
One-piece Brown Bakelite Section
Circuit Numbering Tag
(FA) Catch Lock on doors 48 inches or less in heighth
Main Lugs under blank section
One-piece galvanized steel mounting back
Four Mounting Slots instead of holes

This shows the rugged yet simple design of the (FA) 30 ampere Tumbler Switch used in (FA) LNT1P Panelboards.

Each section is of Bakelite, *molded in one piece*. There are no removable covers to fall off or become loosened by tampering . . . All parts, including the switches, are applied from the rear . . . The switch frames, main contact members to bus, and the required rivets to secure other parts, *are molded into the section* . . . Screw connections have been reduced to the minimum to assure uninterrupted service. The connection between the main bus bar and the branch circuit switches is accomplished by means of a new design clamp contact, which also contains the branch circuit switch contacts as an integral part. Direct copper-to-copper contact is thus secured without the use of screws or other accessories.

Each section contains four (FA) 30 ampere, single pole, heavy duty tumbler switches, with plug fuse connections . . . Branch Circuit tumbler switches are rated 30 amperes, 250 volts DC, and are of the quick-make, quick-break type, with double-break contacts.

(FA) Panelboards, for surface or flush mounting, are available with from 4 to 42 branches; with main lugs only, or with safety type main fuse disconnect, or (FA) Shutlbrak safety type main switch. They are fully approved by Underwriters' Laboratories, Inc.

Write for Bulletin 67

It contains complete descriptions, specifications, sizes, wiring diagrams, and prices . . . Frank Adam Electric Company, St. Louis, Mo.

EST. THE SIGN OF A (FA) 1891 BETTER JOB
Frank Adam
ELECTRICAL PRODUCTS
for War Industry
FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

GREAT NAMES in American Progress

ROBERT FULTON, BOAT BUILDER — On a fateful Friday in 1807, a skeptical crowd gathered at the foot of Cortlandt Street, New York. They came to watch "Fulton's Folly" attempt the "impossible" by traveling without sails from New York to Albany. Those who came to jeer stayed to cheer. "Crazy" Bob's puffing, snorting Clermont wheezed away from the jetty and grunted upstream against the wind at the miraculous speed of four miles an hour. On that day, Robert Fulton, well-nigh penniless dreamer, revolutionized the water-borne transportation of the world.

AMERICAN BLOWER

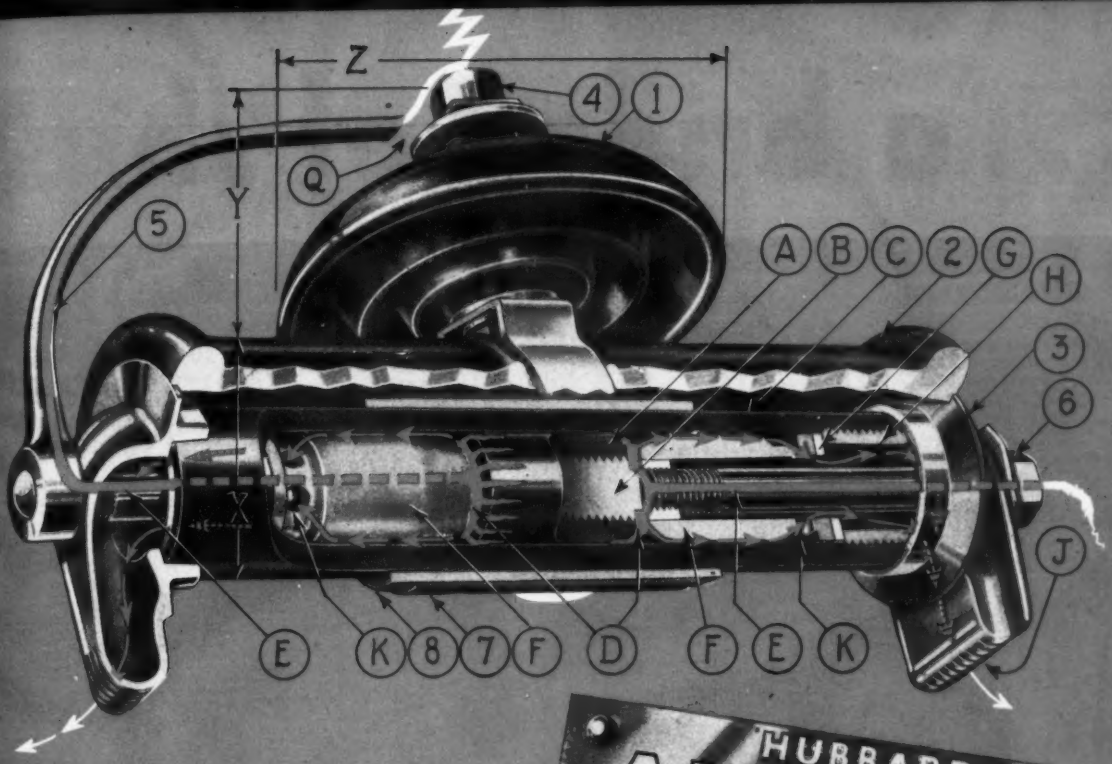
American Blower products have contributed much towards the progress of American industry — progress that today is making it possible for America's vital industries to outproduce the world. In the great public utilities, the steel industry, in the manufacture of petroleum products, chemicals, in food processing, mining, smelting and refining, in hospitals, schools, public buildings and homes, American Blower air handling equipment has kept pace with progress.

Utility Set

CONTRACTORS — DEALERS — We're working 100% for victory. But you can still buy American Blower products for vital war work. After victory we'll be ready with the most complete line of heating, ventilating and air handling equipment in history.

ARMY E NAVY
For excellence in production

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN Radiator and Standard Sanitary Corporation



1. Wet Process Porc. Ins.
2. Wet Process Porc. Tube
3. Exhaust Shield
4. Line Terminal
5. Arc Horn
6. Ground Terminal
7. Steel Sleeve
8. Fibre Sleeve
A. Composite Fibre Barrier
B. Threaded Core
C. Fibre Tube
D. Electrodes
E. Stud
F. Fibre Exhaust Sleeve
G. Washer
H. Threaded Sleeve
J. Exhaust Vents
K. Exhaust Ports
Q. External Gap

HUBBARD AUTOGAP LIGHTNING ARRESTERS

The path of a lightning discharge through a Hubbard Autogap Arrester is shown by the heavy red line, solid and broken. Arrows show the course of exhaust gases after the arc is blown apart. Although, for sake of clarity, the illustration shows numerous "streamers" encircling the barrier "B", this is not necessarily true to fact, since the path MAY be single for each operation but through many operations, will seek a multitude of DIFFERENT paths.

1 The Autogap Barrier "B" offers a cylindrical gap of fibre between electrodes "D". In operation, the path of lightning discharge is over any part of the surface of this cylindrical barrier. THERE IS NO "BEATEN PATH"!

2 Due to the gap "Q" the barrier "B" is not in a leakage path to ground, therefore not subject to CONTINUAL burning by leakage currents. This feature also provides Hubbard Autogaps with a long life of service. AUTOGAPS OPERATE ONLY WHEN NEEDED.

3 The "explosion" resulting from operation under excessive voltage is exhausted in two opposite directions from the barrier with ample freedom of passage to the open air. One more point providing longevity of service without interruption or MAINTENANCE.

4 Installation may be made on crossarm, pole or transformer and all three types may be easily covered with rubber blankets. Unexposed line connection styles may be obtained if desired.

5 Made in several styles, various capacities and with mountings for any circuit, all styles operating on the same principle.

Make a note of these Features—

HUBBARD

HUBBARD AND COMPANY

PITTSBURGH OAKLAND CALIFORNIA CHICAGO

. . . "a bridge of ships

"See-ability"... helps put ships together in record time . . .

America's 1943 output of ocean-going freighters is set at 19,000,000 tons . . . more than double 1942 production.

To attain this goal, scores of supporting industries must continue to contribute their highest skills.

For example, the lighting industry! In shipyards everywhere—in the drafting rooms, the mold lofts, machine shops, and on the ships themselves—"See-ability" is helping men work more accurately and effectively.

Yes, helping men build ships is one of the lighting industry's most important jobs . . . one for which millions of brighter, long-lasting Westinghouse Mazda Lamps are ear-marked.

You can help by conserving lamps

Copper, tungsten, nickel, and other critical materials are used in making lamps. Make these supplies go farther by getting the most light from each lamp you use. For helpful suggestions, write for a booklet "See-ability for Indoor Eyes". Westinghouse Electric and Manufacturing Company, Lamp Division, Bloomfield, N. J.

KEEP YOUR DOLLARS FIGHTING . . . BUY WAR BONDS

to span the oceans"

OVER 50 UTILITIES

using PM plan to help power customers avoid Electrical Breakdowns

Introduced a short time ago, Anaconda's Preventive Maintenance Plan is being widely used by utilities to help customers keep electrical systems operating *efficiently*—despite shortages in essential wiring equipment.

Already some 50 utilities are actively engaged in this program. With it, they are helping their industrial power customers maintain continuous wartime production by preventing electrical breakdowns.

WHAT THE PLAN IS

The PM plan is a simple but comprehensive way to safeguard war production by preventing electrical breakdowns *before they develop.*

HOW IT WORKS

The plan provides a practical means of making periodic, systematic analysis of circuits and equipment. Uncovers potential weaknesses . . . suggests ways to correct them . . . prevents overloading of lines.

Data thus gathered aids local W.P.B. Branches in reaching decisions on requests for materials to *prevent* breakdowns.

HOW UTILITIES BENEFIT

The PM plan helps utilities maintain close customer contact despite a lack of "something to sell." Offers basis for service campaign that definitely appeals to customers. Puts the utility in a leadership role for furthering war production throughout the area it serves.

If you aren't already utilizing the Anaconda Preventive Maintenance Plan, mail the coupon for full details.

"Tomorrow may be too late . . . do it today!"

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

ANACONDA

Anaconda Wire & Cable Company
25 Broadway, New York City 4

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding wartime production.

Individual .....

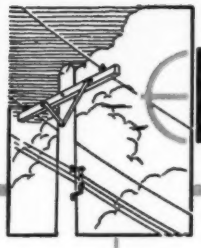
Company .....

Address ..... City .....

9H

SEPTEMBER
1943

Volume 23 No. 9



ELECTRICAL SOUTH

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Manager

W. E. COOGLER,
Production Manager

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GRANT BUILDING
ATLANTA, GEORGIA

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Member of A. B. P.
Member of A. B. C.

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ANNUAL SUBSCRIPTION—$1.00
THREE YEARS—$2.00
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Faith in the Future

What's Behind the Trade Mark?

QUALITY
TRADE MARK
YOUNGSTOWN
SERVICE

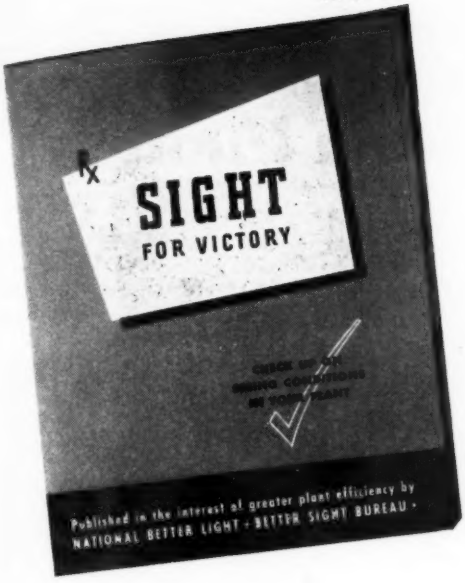
The Youngstown Sheet and Tube Company was founded in November, 1900 by 47 local investors, with an authorized capitalization of $600,000. In December, 1901, this capitalization had been increased to $4,000,000 to provide for the expanded program decided upon by the men of vision who planned the future of this company.

In February, 1902, 14 months after the initial meeting of the shareholders of this company, the first product carrying the Youngstown trademark was produced. In this same year, these pioneers took the first step to assure complete integration . . . the first producing blast furnace was purchased... the first ore properties were acquired... and the first coal lands obtained. These early acquisitions all served as a nucleus around which was created the great industrial organization, which in later years served mankind in every corner of the globe where products of civilization were making life more complete.

We are doubly appreciative of the efforts of those who preceded us at Youngstown. These men of faith, courage, foresight and action have bequeathed to us those things with which we can make a definite contribution in helping to win freedom for the world today, and upon which we can help build an assured prosperity for the future.

Pipe and Tubular Products - Sheets
Plates - Conduit - Bars - Tin Plate
Rods - Wire - Nails - Tie Plates and
Spikes - Alloy and Yoloy Steels

The YOUNGSTOWN
SHEET AND TUBE COMPANY, Youngstown, Ohio
Manufacturers of
CARBON · ALLOY AND YOLOY STEELS



Sight for VICTORY

By Roy A. Palmer
Regional Vice Chairman,
Better Light-Better Sight Bureau

WITHOUT LIGHT, the best of eyes cannot see; with meagre light, the best of eyes can see little; with an abundance of light at low brightness the best eyes can see well and even poor eyes an see better.

Thus we can easily realize how important is good lighting in industrial plants producing great quantities of war goods in the shortest time possible. All lighting people in the electrical industry know this. They know through practical experience that good lighting not only makes for *good* seeing but for *speedier* seeing as well. Consequently, the quicker a worker can see, the more he can produce in a given time. Many industrial executives know this too and have installed good lighting in their plants. There are a great many others who either do not appreciate the value of good lighting as a production tool or, if they do, they haven't done anything about it.

There are a large number of new plants which have been constructed to produce war materials. In most of these, good lighting has been installed. But there are thousands of older plants — and particularly the smaller establishments in which the lighting is far below that which is necessary to provide good seeing. These plants need new or improved lighting to speed "Sight for Victory."

There are 31,285 manufacturing plants in the Southern states which are estimated to be 70% on war production. The Better Light-Better Sight Bureau has a program to bring the advantages of good lighting and seeing to the attention of not only the factories in these states, but in every state of the union. By a systematized and organized effort among all lighting interests a check and survey will be made on all large and small manufacturing plants. This campaign will continue through this year and up to July 4, 1944.

The procedure in the program includes a personal call on the proper executive in each plant by the local lighting representative. The executive wlil be presented a copy of the booklet "Sight for Victory" and its contents discussed with this executive. The booklet, attractively printed and replete with illustrations, explains in plain, concise statements why good lighting is needed for good work and how it can be achieved. The illustrations and text convincingly show how good lighting enables people to see faster, more accurately, more easily and more comfortably and how this in turn will mean increased production of war products.

The fact that most war workers are new at their jobs means that they must use their eyes even more than skilled workers who have learned to do many operations almost automatically. Then, too, with all workers, skilled and unskilled, when good seeing saves time, conserves their energy, reduces spoilage, improves morale and makes for greater safety, their productive efforts are bound to be greater.

Brief but effective discussions of lighting fundamentals — glare, shadows, contrast, together with suggestions on eye care, give the reader a quick picture which he can apply to the lighting and seeing needs in his own plant. Specific cases are cited where better lighting has increased production, thereby serving to further build confidence in the tangible benefits which can be derived from improved seeing conditions.

This booklet, which can be procured from the Better Light-Better Sight Bureau, 420 Lexington Ave., New York, provides the backbone of this program in that it is an attention getter, it provides information which can be assimilated easily and quickly, and it contains a survey sheet which can be quickly checked to give the representative the necessary information upon which recommendations can be made.

After recommendations have been made, a follow-up should be made to see that they have been carried out. In many instances, further assistance may be needed in solving specific lighting problems.

Here is a program in which the entire electrical industry can cooperate. The knowledge, skill and experience in lighting possessed by various individuals in the industry are the means by which a tremendous impetus can be given to the production of war materials.

How to Check Seeing Conditions In a War Production Plant

By H. M. Horton*

ANY NEW LIGHTING, going into war plants, uses critical materials — wiring, lighting fixtures, lamp bulbs and tubes. The thousands of war plants which still need improvement in seeing conditions, however, will call for the greatest ingenuity on the part of lighting men to improve seeing, *with the very minimum use of new equipment.* The job today is to improve the existing lighting installation—to do everything possible to make the best use of what is already there—before even thinking of new equipment.

It is by no means as serious a problem to solve as one might imagine at first. It isn't a matter of making something out of nothing; it is, on the other hand, a case of merely making a little closer study and analysis of our lighting stock inventory to see that it's being used at top-notch, 100% efficiency. Very briefly, it means putting the emphasis on such things as getting all the light out of present fixtures, cleaning or painting walls and ceilings, relocating lighting equipment or machines, getting rid of glare, showing workers how they can help themselves to improve their own seeing conditions, etc. As a matter of fact, if sufficiently close study is given the problem, one may soon discover, believe it or not, that he's obtaining two or three times more value received from what he's already got.

Of course, no plant superintendent nor engineer will concern himself greatly about such details unless he's thoroughly convinced, in his own mind, that good lighting is an aid to vision and increases production. Space does not permit us to delve into the ramifications of this most important phase of lighting other than to point out that there are literally thousands of examples where *good lighting* has materially increased production. In fact the results are so *conclusive* that the government has specified good lighting as a "must" in many of the war plants over which they have jurisdiction.

Taking the above premise for granted it directly follows then, that every industrial plant operator should consider it his immediate and direct responsibility to see that the lighting system regardless of how much or of how little it consists be maintained at its maximum of productive efficiency at all times. Consequently the remainder of our discussion will be devoted to an account of the usual procedure followed by a lighting engineer in surveying an industrial plant to determine what might be wrong with the lighting and then prescribing a cure which will utilize the minimum of critical materials.

Survey Procedure

In making this survey the lighting engineer must at all times bear in mind two fundamental principles of good lighting practice which will enable him more readily to detect the faults of any particular lighting system:—

(1) Make sure there is always *enough* light in *enough* of the *right places,* and of the *proper quality.*

(2) Distinguish readily between "negative" light (light in the workman's eyes which prevents him from seeing quickly, accurately and comfortably) and "positive" light (taken out of the eyes and placed on the work which makes for quicker and easier seeing).

There are also certain important and fundamental facts regarding the relationship of light to vision and work, the proper observance of which is vital to the efficiency productivity, and safety of plant operation. Therefore, in properly evaluating seeing tasks and prescribing the correct kind of lighting for the job it is important that the following also be borne in mind while the survey is being made:

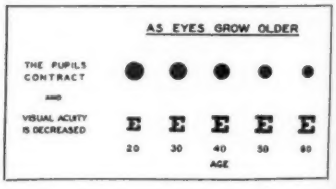
(1) To see penciled writing as easily as printing takes five times as much light.

(2) To see black threads on dark cloth takes fifty times as much light as to read an inked-in tracing.

(3) Glare in the field of vision may reduce the value of a given

illumination level as much as fifty percent.

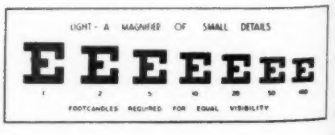
(4) The pupil of the eye becomes smaller with age; consequently, there is need for more light as the workman becomes older. The



necessity of using older employees in war plants today, puts an added responsibility on the lighting system.

(5) A man who uses his eyes under poor lighting conditions for a prolonged period of time often develops tenseness and other unobvious evidence of eyestrain. Eyesight and energy must be conserved to prevent waste and high turnover of manpower.

(6) Light acts as a magnifier of small details. An object must be



*Mr. Horton is division lighting engineer at Atlanta, for Lamp Department, General Electric Company.

twice as large to be visible under 1 footcandle of light as it would have to be under 100 footcandles. More and better light in the key spots makes eye tasks easier, quicker, and more accurate.

(7) The eyes readily adjust themselves to a variety of conditions and are slow to complain of their need for glasses and better lighting. Just because an operator doesn't complain is no sure sign that he could not work faster and better with improved lighting.

(8) Good lighting generally aids defective eyes even more than it helps normal eyes. By the normal selection process there will be more defective eyes in industry than ever. It is well that the management should check and correct eye defects and provide the best light possible.

(9) The machinist needs more light to quickly and accurately see a scribe mark or center punch on metal than the draftsman needed to make the original drawing.

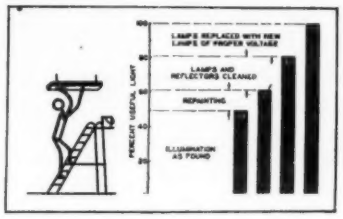
(10) The stock room clerk needs more light to find material rapidly and without error than does the office employee who wrote out the order.

With the above facts and figures written indelibly into his conscious, as well as subconscious mind, the lighting engineer is enabled to make an intelligent survey of an industrial plant. There are always certain elements of the installation which the engineer is looking for at all times as they are the most obvious to him, and yet they represent cardinal faults of the system which, if left uncorrected, will result in wasted human energy and eyesight, will slow down essential production, and will increase waste and accidents. Sometimes, these have been most aptly referred to as lighting "bottlenecks." To search them out in every war production plant, is very important—*to cure them is vital.*

Let us follow the lighting man around in several typical industrial plants to see just what are these problems or faults, and to learn the prescription he prepares for their cure.

Dirt on the Lighting Equipment

This is the commonest of all lighting faults and the easiest to cure. Who would not like to obtain twice as much light at *no added expense* other than the price of a little soap and water, and an hour or two

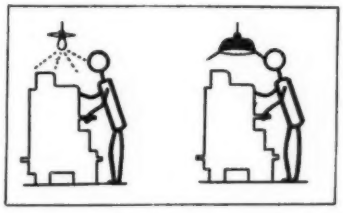


of labor? Yet, oftentimes, lighting levels can be cut as much as fifty per cent by dirty lamps and fixtures. The insidious thing about it is that the process is so gradual that no one seems to appreciate what is happening from day to day until at last workmen commence to complain of eyestrain, headaches, lowered efficiency, etc., which is traced down to the fact that light simply can not be transmitted through nor reflected from dirt.

The only solution is to assign someone to clean the fixtures regularly and periodically before very much dirt has been allowed to accumulate.

Direct Glare from Light Sources

Too much light in a worker's eyes, too little on his work. Lighting units may be too bright because they are equipped with larger lamps than they were designed to shade, or fixtures may be hung too low.



Remember that glare is more injurious to vision, or a worse condition, than an insufficient amount of light. Furthermore, glare wastes, in extreme cases, as much as 85% of the light because sharp glaring rays of light thrown into the eyes actually *prevent* the workman from seeing.

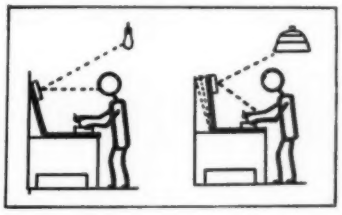
Many have the mistaken impression that if more light is needed on the work, then it is a comparatively simple expedient to lower the light source until it is close to the work. True, there is a tremendous increase in footcandles but the light is raw and glaring. It is always better to have a little light of *good quality* than an abundance of glaring light.

A good example of the above are the seeing conditions which exist when two automobiles are approaching one another on the highway at night. There's about twice as much light on the roadway, between the two cars, as there was with only one car on the road, but neither driver can see one tenth as well due to the blinding headlights of the oncoming car.

The first step to effect a cure from direct glare is to shade all lamps properly and put the light where it belongs—on the work. To use a homely expression, even a number 2 tomato can for a shade or reflector is better than attempting to work in glaring light.

Reflected Glare

This is often more objectionable than direct glare. It may be caused by equipment that does not diffuse the light sufficiently, of from improper location of supplementary lighting units. It is worse when the

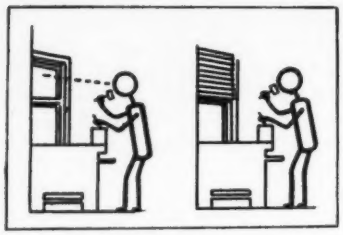


mirror-like reflections prevent you from seeing, for instance, the readings on a micrometer, the lines on a tracing, how to cut or shape a piece of bright metal, or where the defects might be in a sheet of glass. We all know how difficult or impossible it is to follow the course of a fish, swimming around in the water, when he reaches a point directly beneath the surface reflections caused by the sun's rays.

A solution to the problem is to change from concentrated light sources to a large-area light source. Adequate covering for the lamp to assure a diffusion of light, plus proper placing of offending supplementary units, so that the reflected light goes to one side and not into the workman's eyes can help. Sometimes, merely changing the angle of the work may eliminate reflected glare.

Daylight Glare

Seeing is difficult when workers' eyes have to contend with strong daylight glare, that is, when the job is between their eyes and the windows. This condition fre-



quently arises from the improper placement of benches, machines, drafting boards, etc.

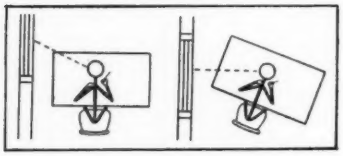
It is merely a case of excessive brightness contrast which in extreme cases constitutes another form of direct glare. Even though we have the correct intensity and proper quality of artificial light on the work, remember that we may be looking through the window at thousands of footcandles on the outside as against possibly 25, or even 100 footcandles on the work. The eye adjusts itself to the higher brightness so that the work next to the window can not be seen quickly nor comfortably.

As proof of the above conditions, or as a test you might wish to conduct yourself to determine whether there is excessive daylight glare, have a man stand 5 or 6 feet from a window, and then try to examine his face with the window for a background. Then move to the window and examine the man again, in the same location and from the same distance, but with your own back to the window. The eyestrain will be relieved and visual acuity greatly improved.

The solution to this problem is to shade the windows or, wherever possible, shift working surfaces to put natural light on the work rather than in the workers' eyes.

Reflected Glare from Daylight

This consists of daylight from a window striking a surface and being reflected into the eyes. The



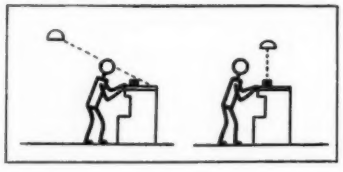
surface may be a desk top or the parts or material of the job being done—a sheet of metal, for example.

The cure is to shade the light source or provide a high enough indoor lighting intensity to offset, as much as possible, the reflected daylight.

Interfering Shadows

Every worker knows the problem of "standing in his own light", or the story of the housewife who is a proverbial "shadow dodger" as she attempts to work over the hot stove or kitchen sink, illuminated from a single bare lamp or ridiculously small enclosing globe in the center of the room. To compensate for

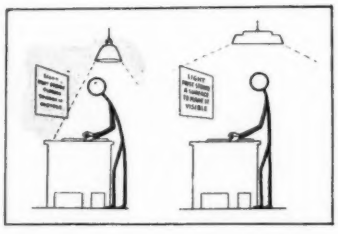
the shadows, the workman has a tendency to move his eyes closer and closer to the work, but the density of shadow increases almost in direct proportion.



The only complete cure is to have light coming from more than one direction such as is provided by adequate general overhead lighting. The next best remedy is to increase the number of light sources.

Poor Illumination On Charts

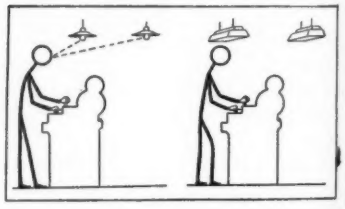
Charts, blueprints, diagrams, etc., to which workers must refer frequently are often underlighted.



Eyes are called upon to shift more or less continuously from bright illumination on the job to a lower intensity on the chart, necessitating corresponding adjustments of eye focus. The ratio of light on the work to the surroundings, regardless of the task or location, should be at least 5 to 1 or not more than 10 to 1. Otherwise, the constant changing of eye focus soon brings on eye discomfort, nervous derangements, etc., with accompanying mistakes in workmanship and lowered efficiency. The obvious cure is to equalize the illumination.

Glare from Multiple Sources

Improper suspension of lighting units can result in bright light sources being directly in the line of vision, causing discomfort to workers and a slowing down of work. Look for a moment at a bare lighted lamp; then turn and look at some other object. Notice that a little time must elapse before you can see the object clearly. You are really experiencing a miniature blackout due to so-called after images. The condition becomes



quite a serious problem and multiplied several times when eyes are exposed to many bare lamps.

A good test to try out sometimes is to shade your eyes with your hand from the lighting and determine whether or not there is any appreciable increase in eye comfort. If there is, then the light sources are too glaring.

The solution, usually, is merely a matter of providing a properly adjusted reflector, or adding a well-designed baffle between the eyes of workers and the light source if the lamps are relatively close to the work, or just shading the lighting units if it is an overhead system of general illumination.

Specular Reflectors

When light sources are reflected to the eye from polished surfaces, specular glare results, which is a form of "reflected glare". Machined metals such as steel, brass and aluminum can reflect like a

mirror. Details on glossy and semi-glossy surfaces are obscured.

Specular reflection can be reduced by increasing the general lighting or the size of the light source, or changing the position of offending units. Remember that the best solution, if possible, is totally indirect lighting for then the reflection from the specular metal will be relatively even and of low brightness. Special indirect lighting cures have often been constructed for sheet metal of this kind where specular reflection is particularly troublesome.

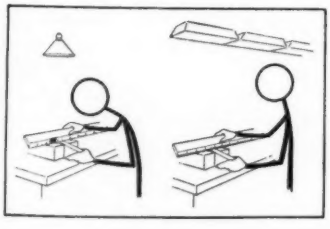
Line-Light Shadows

The trend to line-light sources in industry, such as continuous rows of fluorescent fixtures, has introduced a convenient shadow control. Hold a pencil at a 90° angle to a line-light source, and there is little or no shadow. Hold it parallel to the light source, and shadows result. In other words we have waves of light coming down from one direction, rather than pools of light from all directions as produced by incandescent, filament light sources.

The cure is to change the angular position of the lighting units with respect to work, or vice-versa. The best angle of the lighting units with respect to the work, considering all factors, is 45°. This is a particularly desirable condition in drafting rooms as rather sharp shadows are produced by the edges of "T" squares, triangles, and other instruments when they are parallel to the light sources.

Not Enough Light to See Quickly Or for Fine Adjustments

It takes time for eyes to see. They do the job faster when the illumination is good. Less light slows them down. Also, this is a serious



time waster where gauges have to be set and adjustments made on machines. A micrometer may be carried to a window, but not a heavy machine.

There is just one known cure—to provide better illumination at the machine so that fine details are easily visible and the workman's eye has quicker discerning ability.

Lack of Paint-Brightness Contrast

Light reflected from walls and ceilings contributes materially to the illumination on the job. As a matter of fact, good lighting and proper painting are two inseparable companions in the production of "Light for Seeing and Production". The one is of relatively little value without the other. For example, imagine, if you can, a building interior which otherwise might have been well lighted except that there are no windows or other openings to allow for the entrance of daylight, and all surfaces are painted a jet black. Under such conditions, the only thing which could be seen in the room would be the light sources, because the light incident to all other surfaces could be almost completely absorbed by the black paint, and very little, if any, light would be reflected. Since we see very largely by the light which is reflected from various objects, it directly follows, then, that dark surfaces waste light.

Many installations can double, triple, quadruple or, in extreme cases, put even greater amounts of light on the "working plane" by correct painting, using light colors or tints.

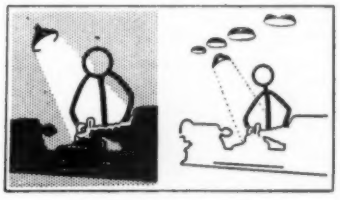
Proper painting also tends to relieve the serious annoyance of sharp brightness contrasts, like, for instance, a white sheet of paper on a dark covered desk, or the brightness of a lighting fixture against a background of dark or dirty walls and ceilings. The trouble is not with the lighting system being too bright or glaring but rather the lack of proper painting. Just a single, lighted candle, under certain conditions, can be too bright or glaring, but no one would ever say that the candle provided sufficient light for any kind of close visual work. A lighted candle placed on the window sill of an otherwise unlighted room, and against the dark background of night can be most glaring, while the same candle would hardly be noticed in the daytime.

Even the proper painting of machinery and equipment is now being seriously considered in a "Three-Dimensional Seeing" program being developed by the E. I. du Pont de Nemours & Co. By the combination of certain colors, the visual acuity of the workman is considerably improved to the end of speeding up work, reducing accidents and mistakes, and improving worker morale.

As a consequence, sometime, in the not too distant future, we may expect to observe lighter colored machinery, shipped from the factory, rather than the customary drab and dark colors which have always been an obstacle to good seeing and safety.

General Illumination Inadequate

Localized lighting has a place in industry but should not be used exclusively. It should supplement general overhead lighting, and the ratio between it and the general room illumination should not exceed 10 to 1. Localized lighting alone



produces a bad contrast situation which makes for excessive eye fatigue.

Furthermore, when the general illumination is inadequate, it becomes a problem aggravated by the fact that war production requires the three-shift operation of plants originally lighted for a single, eight-hour daylight shift. War orders require a 24-hour working day, so that night shifts must equal day shift production.

As a consequence, we may have been able to get by formerly with poor general illumination, supplemented with daylight, but such lighting conditions are well nigh impossible when the night shift rolls around.

Now that we have pretty well made the rounds of several industrial plants with this lighting engineer as he made his study of "faults and cures" in the lighting system, many may quite justifiably ask the question as to what are some of the more important gadgets or accessories needed for effecting changes in or properly maintaining the lighting equpiment.

Anticipating such questions, we are listing below some of the more important lighting maintenance devices which should assist you in correcting some of the more flagrant

(Continued on page 84)

Plenty of Paint and Soap Key to Lighting Efficiency

By John J. Neidhart*

MAXIMUM efficiency without sacrifice of quality has always been a goal of American industry. In the past, peak efficiency has meant only greater profits and improved consumer goods at lower prices. Today, however, efficiency has taken on a new and much more important meaning, for the more quickly and efficiently our plants produce the vital material needed to supply our fighting forces, the sooner we will achieve our goal—Victory.

If we examine the different ways that productive efficiency may be increased, we soon learn that high levels of proper quality illumination enable workers to produce more goods with less effort. Although it is essential that the lighting installation be carefully designed to obtain the best results, we shall not discuss the design of the lighting system but shall instead see how we may obtain optimum operating efficiency of any lighting installation.

The efficiency of any given lighting installation is dependent upon two things: (1) the painting of all surrounding surfaces which might absorb some of the light, and (2) the maintenance of the lighting equipment.

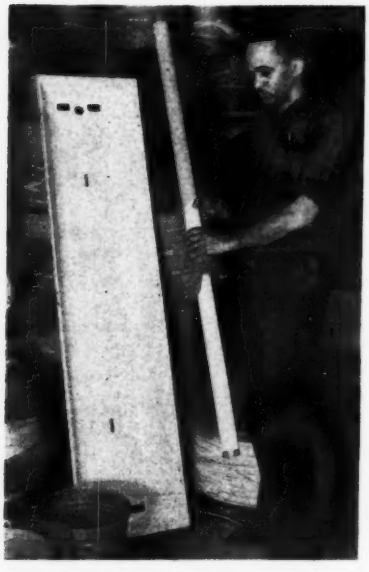


Fig. 1. Take down lamps and reflector for cleaning at regular intervals.

Effect of Painting

High reflection factor, matte or semi-matte surfaces, are essential for maximum utilization and diffusion of the light. Ceilings, walls, trusses, columns and machinery may absorb a considerable percentage of the light if their surfaces are not painted a light color, causing most of the light striking the surface to be reflected, increasing the amount of light reaching the working plane. Selection of the paint to be used should be governed by the following requisites:

Fig. 2. Wash reflector thoroughly with soap and water.

Reflectivity — High reflection factors lead to high efficiencies, and it is, therefore, desirable to paint all ceilings, walls, trusses, and columns with a paint having a reflectivity of 75 per cent or better except for a darker wainscot below the working plane. Although it is not possible to maintain this high reflection factor for an extended period of time in factory areas having a dirty or oily atmosphere, the reflectivity will at all times be higher than if it had been low initially. The reflectivity can always be restored to its initial value, of course, by repainting or by washing.

Fig. 3. Wash lamps thoroughly before replacing.

Finish—Glossy finishes should be avoided because the resulting specular reflections of the light sources will cause annoying glare. A matte finish is most desirable in clean areas since it will provide for greatest diffusion of the light and will completely eliminate specular reflections. A semi-matte or eggshell finish is usually more satisfactory, since it has a smoother surface which does not collect dirt as easily as does the relatively rough surface of a matte finish.

Durability — In every factory, the reflectivity and appearance of

*Engineer, Lighting Division, Westinghouse Electric and Manufacturing Company, Cleveland, Ohio.

the paint may eventually be impaired by dust and dirt collections. It is, therefore, advisable to select a paint which is moisture resistant and levels out to a smooth continuous film which is resistant to soiling and may be washed frequently with soap and water. If the painted surfaces are exposed to vapors and gases, special fume and moisture-resisting paint should be employed.

Color—In general, all surfaces except the machinery should be painted white since white has a higher reflectivity than any color and helps create a bright, cheerful atmosphere. White paints are often tinted slightly with blues or yellows, but tests have indicated that the natural or warm whites depreciate less with age than do the blued whites. Slightly blued whites are often the most desirable, however, when used with incandescent or 3500° white fluorescent lamps since the blue tint will tend to be color-corrective and provide a more balanced, nonchromatic white light. The machinery may be painted a medium gray, but tests have shown that visibility and safety may be enhanced by painting the working area of the machine a lighter, contrasting color such as buff or cream.

Advantages of Proper P...

High reflection factor surfaces will increase illumination and also provide for better diffusion of the light, minimize shadows, reduce harsh shadows between the light sources and the surroundings, improve seeing comfort and prevent the illumination from dropping off near the walls or around large columns.

A worker should never be forced to look up into dark surroundings when he raises his eyes from his work, for it will have a detrimental effect upon his eyes and lead to defective eyesight. When a person shifts his eyes from a bright area to a dark one, his eyes must readapt themselves to the different intensity. The eyes accomplish this by two means: (1) the pupil becomes larger to admit more light, and (2) the retina becomes more sensitive to light. When the person looks back at his work, his eyes must go through this same procedure in reverse. Since a worker looks up rather frequently to rest his eyes by allowing them to focus on a more distant object, it is important that he look up into light surroundings.

Scientific research has shown, for example, that 12 per cent less work was done when the eyes alternated between two brightnesses, one of which was 100 times greater than the other, than when the brightness was uniform. Furthermore, light surroundings create a more cheerful atmosphere and improve worker morale. Dark walls and surroundings, on the other hand, have the same effect as a dark, gloomy day and tend to depress people who work within them.

Before and after checks on the illumination in various factories have proved that the illumination may be increased 100 per cent or more by proper painting alone. For example, an Ohio manufacturer found that the illumination in his factory was increased from five footcandles to 15 footcandles by merely repainting all interior surfaces to prevent light absorption. Benefits resulting from such an increase in illumination be-

Fig. 4. Lowering a luminaire to the floor where it may be cleaned more conveniently is quickly accomplished with the aid of an automatic disconnecting hanger. Equipment of this type is valuable in high bay areas.

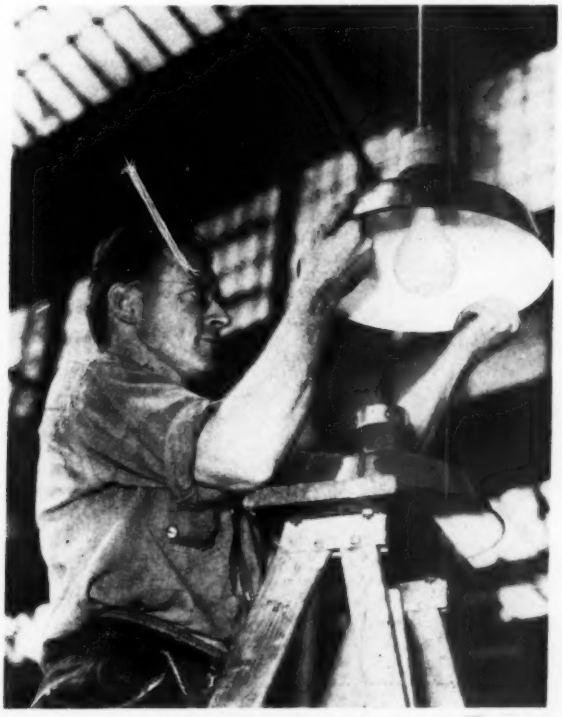


Fig. 5. Removable reflectors make it possible for the maintenance man to remove a dirty reflector and replace it with a clean one that is carried as an extra. He then washes the dirty reflector on the floor and repeats the procedure at the next luminaire.

come even more significant when one considers that it does not include the more intangible benefits of better diffusion and improved seeing comfort.

Lighting Maintenance

Maintenance departments of all factories should devote special attention to the care of lighting installations. Planned maintenance will assure peak efficiency and prolong the useful life of the lighting equipment. The best 50 footcandles installation is no better than a comparable 20 footcandle installation if burned out lamps are not replaced and the reflectors are not kept clean, reducing illumination to a fraction of its designed maintained value.

A well-planned maintenance program divides itself into two phases: (1) the cleaning of the lighting equipment and reflecting surfaces to remove dust and dirt; and (2) the relamping of the luminaires immediately after lamp burnouts or on a systematic plan.

Cleaning—The permissible time between cleanings is peculiar to each installation since the rate of decrease in light output varies with the type of lighting equipment and the amount of dust and dirt in the air. Dust-tight covers will simplify the maintenance problem considerably in extremely dirty atmospheres such as are prevalent in foundries. The best method of establishing a cleaning schedule for any installation is to make periodic checks of the illumination with a light meter. The length of time required for the illumination to drop to approximately two-thirds of its initial value may be arbitrarily taken as a satisfactory cleaning period in most cases. This period may be as short as three or four weeks in extremely dirty locations, but it will usually be from two to six months under average conditions.

When luminaires are cleaned, all reflecting surfaces and glass covers should be thoroughly washed with soap and warm water. Merely wiping off the reflector or glass with a dry cloth is not only insufficient but it is also apt to shorten the life of the reflector. Greasy dirt and grime which remains after several dry wipings will tend to form a permanent coating which cannot be removed.

Relamping — Rated life of a lamp is the average life of a large number of lamps and is not indicative of the life of any one lamp. Many lamps will have a much shorter life than the rated hours, but an equal number will burn longer than the rated hours. The lamps will, therefore, burn out at sporadic intervals with the maximum number of burnouts occuring at or near multiples of the rated life. Burned out lamps may either be replaced as burnouts occur or on a group replacement plan. The group replacement plan has the advantage that it may be combined with the cleaning program by arranging the cleaning schedule so that the lamps are approaching the end of life at some

Fig. 6. High reflection factor, white surfaces help diffuse the light and improve the efficiency of the fluorescent installation in this manufacturing and repair shop.

Fig. 7. Visibility and lighting efficiency are greatly enhanced by the white ceiling and columns in the machine shop shown here.

even multiple of the period between cleanings. At that particular cleaning, which may be somewhere between 80 per cent and 90 per cent of normal lamp life, the entire installation is relamped and the system is restored to practically its initial efficiency. The old blackened lamps which are close to the end of life may be discarded, but those showing signs of further useful life are set aside to replace the few early burnouts which will occur in the next group of lamps. Such a plan will materially reduce the labor cost of lamp replacement since there will be less wasted effort and setup time required for relamping the luminaries as they are cleaned.

Maintenance Methods — In low bay areas, lighting equipment can easily be maintained from step ladders, but higher bays present more of a problem. In some plants, the fixtures can be cleaned and relamped from a traveling crane, but it is frequently undesirable to tie the crane up for this work. Movable telescoping platform lifts are quite satisfactory in areas where the presence of machinery does not interfere with their use. One of the most convenient means of access to the luminaires is from catwalks, but the installation cost is high and they are feasible only on special applications where all of the fixtures may be mounted on a few catwalks. Automatic disconnecting hangers which permit the luminaires to be lowered to the floor by a chain or rope offer another convenient means of facilitating maintenance. A monorail system provides another quick and easy method of servicing the lighting equipment from traveling platforms or cars and is frequently used for large fluorescent installations.

Disconnecting type hangers or reflectors that are easily removable usually simplify the maintenance problem considerably, since the reflectors may be washed by one man on the floor or platform while a fellow worker removes the dirty reflectors from the luminaires and replaces them with clean ones.

Results of Proper Maintenance

The importance of regular servicing of lighting equipment is strikingly illustrated by the results of tests conducted to determine the actual loss in illumination due to dirt collection on lamps and luminaires. In one case, a porcelain-enameled reflector for a fluorescent luminaire was removed from an average factory area and tested for light output in a photometric laboratory. Light output was checked during various stages of cleaning and results were as follows:

(1) Dirty reflector and dirty lamps—22.8 per cent decrease in light output.

(2) Dirty reflector and clean lamps—18.1 per cent decrease in light output.

(3) Reflector wiped with dry cloth—6.2 per cent decrease in light output.

(4) Reflector and lamps wash-

(Continued on page 88)

Wartime Lighting Equipment

By D. P. Caverly*

IN PRACTICALLY every industry throughout the country, if not throughout the entire world, the war has brought about major adjustments in production methods as well as in the manufacture of the products themselves. As everyone in the lighting industry, or even remotely associated with it, well knows, that industry like all others, has had to make these wartime adjustments.

During the past year there have been times when the problems seemed particularly difficult. Many long engineering hours have been spent trying to devise "another way" whenever the War Production Board found that certain materials would bring Victory quicker, if they were used in some way other than in light sources and lighting equipment. But aside from this fact it looks as though some of the things necessitated by the war will have merit enough in their own right, to stand in competition with previous methods, after the war is won.

In gathering data for this paper, the author sought to obtain the opinion and method of procedure of over two dozen recognized lighting fixture manufacturers in this country. Basically, all of them have followed the same procedure. This is quite understandable since the limitations set forth by the War Production Board have left few alternatives. Of course, all of the manufacturers have their new models of fluorescent lighting units so designed as to comply with restrictions concerning the weight of material and top housing, and utilizing non-metallic reflectors.

It has been particularly difficult to obtain definite data from manufacturers because at the present time the design and production of lighting fixtures is in an active state of flux. This is, perhaps, as true of certain types of incandescent equipment as of fluorescent, so that information concerning steel incandescent reflectors is quite meager.

Holophane Refractors, Pittsburgh Permaflectors, Curtis X-Ray Reflectors and other similar equipment is readily available and being used to a large extent because the amount of critical materials required is very small. These models have not undergone any major change, but the manufacturers seem to be faced with the problem of having their product referred to as "substitutes." As anyone who is familiar with lighting before the fluorescent sources were available knows, glass equipment of this nature is definitely not a substitute material. The quality and satisfactory results of either silvered glass reflectors or prismatic reflectors have long been established in the lighting field.

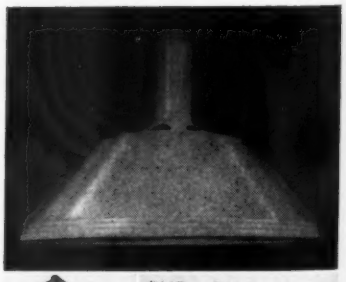
Figures 1, 2, and 3 show typical prismatic glass equipment which is available for commercial and industrial use if the necessary priorities are provided. It can be seen that this equipment is constructed primarily of glass with only enough metal used to provide proper fitting and hanging facilities.

As far as steel incandescent equipment is concerned, there has been no War Production Board ruling restricting types, although such a restriction is partially indicated. Restriction Order No. L-212 limits the gauge of metal used in incandescent reflectors to 24 gauge for equipment up to 750-watt lamps, and 22 gauge for over 750-watt lamps.

A report made to the War Production Board by NEMA proposes a simplification plan which, in effect, meant that RLM domes, deep bowl reflectors, glassteel diffusers, and shallow bowl reflectors would be limited to certain popular sizes, but thus far such a plan has not been placed in operation.

The manufacturers of steel incandescent reflectors have, of their own volition, eliminated certain types of equipment from their lines. As a rule, the heavy duty types, shade holder types, and the solid neck types are available. Approximately 18 other types have been discontinued. Incandescent louvers, shields, baffles, and incandescent reflector bowls of metal have likewise been discontinued.

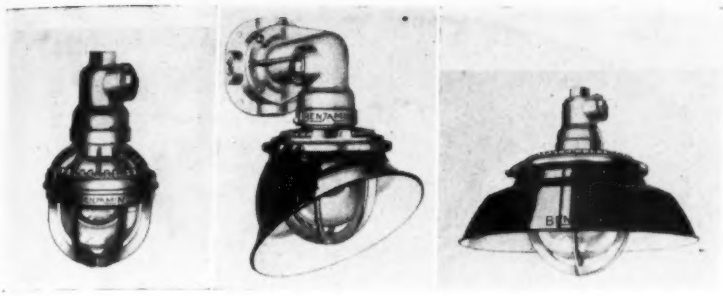
A glance at most of the manufacturers' catalogs will show page after page of reflectors, accessories and fittings across which is stamped either "Discontinued for the Duration," "Temporarily Dis-



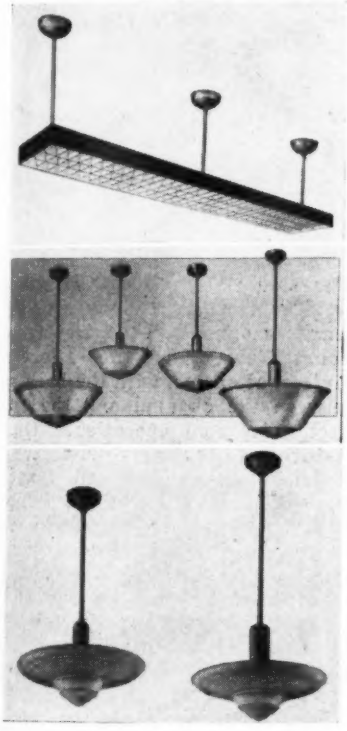
Top: Fig. 4
Left to Right: Figs. 5 and 6

Left to Right: Figs. 1, 2 and 3

*Commercial Engineer, Sylvania Electric Products, Inc., Danvers, Mass. Adapted from a discussion presented before the Northeastern Regional Wartime Lighting Conference, in New York City, New York.



Left to right: Figs. 7, 8 and 9



Reading down: Figs. 10, 11 and 12

continued," or some such phrase. Analysis shows that these pages cover such equipment as metal stage lighting devices, footlights, spotlights and proscenium strip lights. Art gallery and picture lighting reflectors have been discontinued by many manufacturers along with reflectors for lumiline wall cases, displays and show cases. Reflectors accommodating the less standard types of lamps, such as decorative lamps and certain types of tubular lamps, are, of course, useless without light sources to place in them.

The F. W. Wakefield Brass Company have announced, through advertising in trade papers, a plastic industrial reflector. This material, of course, would not be as critical as steel. There may be other manufacturers who have accomplished the same thing, but as yet they have not been publicly announced, as far as the author knows.

Figure 4 shows the Wakefield "Commodore" industrial unit utilizing Plaskon as a reflecting surface. This unit allows some light upward to illuminate the ceiling in order to avoid excessive contrast. It accommodates a 500-watt lamp and the unit is 19 inches in diameter with a weight of 1 pound 7 ounces.

Although many types of local lighting equipment have fallen by the wayside, we find some new designs available. Figure 5 shows the Fostoria bench lighting unit designed to accommodate two 14-watt fluorescent lamps operating in conjunction with the incandescent lamp ballast. It comes completely wired with the switch mounted on top of the housing. The overall length of this complete unit, from the surface to the length of the arm, is 37¼". The mounting clamp is so designed that it will fasten to most benches and tables. The outside finish is gray, with the reflector, of course, of glossy white. It utilizes a non-metallic reflector and the arms are adjustable as in the past. Instead of eight types of arms, as in the past, only four are available at the present time.

The well known Fostoria U-104 model, Figure 6, is still available except that instead of an aluminum reflector it uses a steel reflector with a highly reflective sprayed aluminum surface. This is also available with four types of flexible arms. It accommodates one 100-watt A-21 incandescent lamp to produce a footcandle level in excess of 250 in many applications. It is wired complete with toggle switch in the neck of the reflector and has an oil-resistant cord and plug.

Manufacturers of cast aluminum fittings and housings for explosion-proof units, such as the Benjamin Electric Manufacturing Company, have modified their equipment in accordance with the War Production Board restrictions by changing from aluminum to cast iron.

Figure 7 shows the Benjamin explosion-proof unit, less reflector. The steel casting is finished in sprayed aluminum applied over electro-plating. Figure 8 is the Benjamin explosion-proof angle reflector having the same finish and angle housing as the previous model.

Figure 9 shows the Benjamin explosion-proof RLM dome made to accommodate a lamp in sizes from 75 to 200 watts. Aside from the iron casting, this unit produces the same results as past models which utilized aluminum casting.

These luminaires have ample strength in every part to withstand tremendous pressure of internal explosions without breaking down or permitting flame, gases or sparks to escape and ignite the surrounding atmosphere. Equipment of this nature will satisfy all Underwriters' requirements for installation in Groups C and D, hazardous locations of Class 1. Of course, relatively high priorities are required to obtain any of this incandescent lighting equipment.

Commercial Lines Dropped

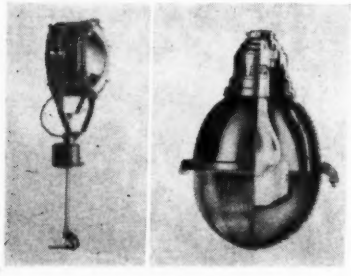
In many instances, commercial lines have been dropped for the duration, but some excellent units are available with high priorities. Figure 10 shows the well known Wakefield "Admiral" commercial lighting unit. Side frame and exposed end frames are constructed of first and second grade birch wood properly kiln dried over which two coats of baked white enamel are sprayed. Fastenings and cement or glue will withstand the temperature and humidity normally found where such types of lighting equipment are applicable. The reflector is Masonite, so designed to provide correct distribution for commercial lighting. The louvers are made of a selected grade of basswood properly dried to withstand the humidity to which they are subjected. The wiring and ballast are housed in a steel channel which complies with the War Production Board restrictions.

The Wakefield "Commodore" semi-indirect luminaire, Figure 11, utilizing a Plaskon bowl, is available for all sizes of incandescent lamps up to the 1,000-watt. The canopy, stem and husk are fabricated from steel and finished with gray enamel infra red baked. The Wakefield "Alden" unit, Figure 12, also uses a Plaskon reflector 19" in diameter. It is available in 200-, 300- and 500-watt sizes, and like the previous one the canopy, stem and husk are of steel.

Home lighting equipment has been limited to six ounces of steel per fixture. Obviously, this will result in little more than a thin canopy for glass globes being available. As far as portable lamps are concerned, the War Production Board restrictions have left manufacturers of portable metal standard lamps without any possibility of manufacture, but the industry, under Order L-33, gave them until July 15, 1943, to use up partly fabricated parts from stock. Manufacturers do not look for any relief as far as metal floor, table or desk lamps are concerned for the duration of the war.

Floodlights appear to be available in steel for essential use. A great many manufacturers are 100 per cent on the production of this type of equipment for Army and Navy war use.

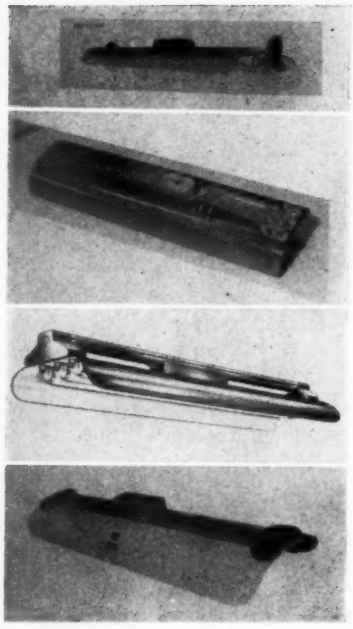
The Westinghouse searchlight, Figure 13, has been designed to comply with Navy and Maritime specifications for use on non-combat vessels. It may also be used for protective lighting of indus-



Figs. 13 and 14.

trial plants. This is an alternate unit in that sheet steel has been substituted for aluminum in the housing, and cast iron for cast aluminum in the door frame. The primary reflector is silvered glass and the secondary reflector is polished aluminum or chrome.

Some of the open type reflectors



Figs. 15, 16, 17 and 18.

which have been used in recreational areas, gasoline stations and similar applications, are no longer available for such purposes. Neither are the small types of handy floodlights for use around the home and garage, although they may be manufactured for other uses of a wartime nature.

Figure 14 shows the Westinghouse Wartime luminaire for street lighting, and protective lighting. Formerly an aluminum reflector was used inside the housing. At present it is being replaced with one of silvered glass which makes the unit approximately 15 per cent more efficient in lumen output. This is not due wholly to the high efficiency of silvered glass, but also to the fact that the glass reflector is different in shape, utilizing more light than formerly.

As mentioned previously, all manufacturers submitting data have stressed their new models of industrial fluorescent lighting equipment. Figure 15 shows Fostoria's new unit designed for two 40-watt fluorescent lamps. It, of course, complies with the War Production Board limitations as far as top housing is concerned, and makes use of a non-metallic reflector.

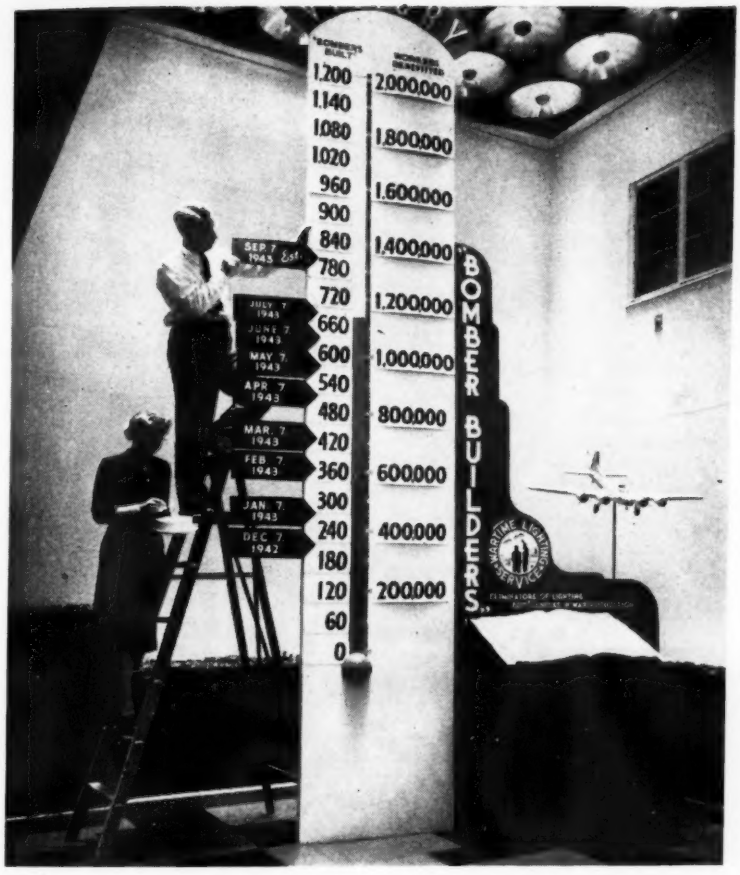
Figure 16 shows Sylvania's new industrial fixture which is available in two sizes, that is for two or three 40-watt lamps or for two 100-watt lamps. The streamlined top housing encloses the ballast protecting it from dust and dirt, and is so designed that practically all methods of mounting can be used. The grooves along the side are for the application of slide grip hangers. Knockouts are provided to permit any variation of stem mounting, and the lugs are for chain suspension. There is also a knockout provision for a pull-chain switch, if desired. The reflector, which has an efficiency higher than porcelain enameled steel, is fabricated from a strong and durable composition material and is fastened to the top channel with a captive latch which permits easy removal of the reflector for cleaning purposes. This unit meets all War Production Board requirements and carries Underwriters' Laboratory approval. It can be used either for individual mounting or in continuous row.

The design of Day-Brite's new War Model shown in Figure 17, provides flexible surface or suspension mounting. The wireway is mounted away from the reflector surface, as shown, with the ballast between the channel and the reflector for cool operation. One feature of the Day-Brite War Model is the one piece end stamping which is welded to the wireway "backbone" of the fixture to insure substantial construction. The unit is available for two or three 40-watt lamps or for two 100-watt lamps. The reflector is, of course, of non-metallic material, easily removed for free access to the wireways.

The new Westinghouse unit, Figure 18, utilizes light weight streamlined steel hoods and pressed wood reflector. It is, of course, designed to comply with wartime restrictions, and carries the RLM label as well as the Underwriters' label. Fixtures, such as the one shown, are available for both 40 and 100 watt lamps.

Figure 19 shows the three kilowatt mercury vapor unit as available from Westinghouse. It is fabricated entirely from steel, and the lumens per pound of steel is perhaps greater than with standard fluorescent equipment even when the latter utilizes non-metallic reflectors and light weight steel channels. Due to its high brightness, this unit is most suitable for high bay lighting applications. The reflector is porcelain enameled.

(Continued on page 30)



80,000,000 Man-Hours Saved By Bomber Builders' Efforts

By Carl W. Maedje

September 1943. On this, the occasion of the nation-wide Bomber-Builder Program's first anniversary, a single footcandle appropriately adorns this activity's birthday cake. The mythical taper symbolizes infinitely more than a year of time.

Its fitful gleam symbolizes the hundreds of thousands of lighting bottlenecks which, a year ago, were sabotaging the war effort in little and big war plants. Despite its feeble glow, it symbolizes the patriotic spirit of a little army of men who have smashed a great number of these bottlenecks. It symbolizes a mighty increase in output of weapons as well as millions of fluorescent lamps and other lighting tools which have routed improper seeing conditions from their fox-holes in American industry.

On the eve of its second year, the Bomber-Builder Program is warming up its reconditioned motors and is taking off with "target for tonight" — and for countless nights and days to come — the remainder of lighting bottlenecks yet to be smashed all along the broad industrial front.

For Dramatic Effect

A year ago, with four-motored flying "forts" capturing the public imagination, the sponsors of the lighting-bottleneck-smashing program, chose the bomber as the symbol of their purpose and of such accomplishments as the program might achieve. They could just as well have selected a tank, a sub, a jeep or any other effective modern weapon being forged in the nation's war plants.

That the bomber symbol has had its proper dramatic effect is clearly and impressively substantiated by astonishing results as are outlined at the end of this tribute. At this point, however, let's brush up once more on how it comes that a lighting man, without much knowledge of a four-motored flying "fort" can build one—let alone build as many as five or ten. Here's how:

Man-Hour Equivalent

Originally, it took as many as 100,000 man-hours to build a four-engined bomber. Obviously, any lighting man who could increase the productivity of men in war plants through improved seeing conditions by at least 100,000 man-hours would, in effect, have built a "flying fortress." Facts are available to show that many an improved lighting job has boosted production 10 per cent — 30 and more per cent in some cases. To be ultra conservative, only a 3 per cent boost was used as the yardstick in the Bomber Builder evaluations.

A 3 per cent increase in the production of a war worker, assuming he puts in only 2,000 hours a year, would amount to 60 added man-hours annually. Divide the 60 into the 100,000 man-hours needed to build a bomber, and you find that 1,667 workers would have to have their seeing conditions improved before a lighting man has, in effect, built a bomber.

By translating man-hours added to industry through the removal of lighting bottlenecks into terms of fighting planes, the Bomber-Builder Activity inspired lighting men to fight harder than ever for their country with a

GOING UP!—Progress of the nation-wide Bomber Builder Activity is recorded on giant thermometer (above) erected in General Electric Institute Nela Park, Cleveland. Names of outstanding eliminators of lighting bottlenecks are inscribed in the Wartime Lighting Service Record Book as shown here. Score at the end of the first year of activity: 800 four-engined bombers; well over a million war workers benefitted by the improved lighting; and 80 million man hours added to the war effort annually! Here you see Grace Withington, Bomber Builders' scribe secretary, lighting a single candle on a real birthday cake as A. E. Lennox, publisher and editor of the activity's pictorial magazine, positions an arrow where it is estimated the "mercury" will rise to on September 7.

weapon as mighty as pen or sword. Besides, he who took the pledge to gear his lighting efforts to the war effort yet to use a minimum of critical materials became eligible at once to receive a silver bomber lapel emblem. His name was inscribed in a War Lighting Service Record Book enshrined at G. E. Institute, Cleveland. And if his efforts benefited as many as 1,667 workers, he was awarded the coveted gold bomber lapel insignia of the Bomber-Builder program. He was accorded enviable oral and written tributes. Now let's train our bomb sights on the results.

80,000,000 Man-Hours!

Several weeks ago ELECTRICAL SOUTH asked the Bomber-Builder sponsors to project official figures of that date to reach a conservative estimate of the score as of one year since the program was launched. Briefly, the facts are these:

Nearly 80 million man-hours a year are being added to the war effort as a direct result of the Bomber-Builder Activity.

These bomber builders — more than 3,000 lighting "craftsmen" and "organizers"—in effect have added to industry an invisible yet highly productive army of more than 33,333 war workers to the work benches and assembly lines of the nation.

The 80 million additional man-hours, if divided by the number of craftsmen participating in the Bomber Program, comes to 100,000 man-hours. Theoretically, each one of the Craftsmen to date has built a four-engined bomber. Each such lighting man, if he had left his job to work at a lathe in a war plant, would have had to put in 48 hours a week for more than forty years to equal the 100,000 man-hours he is adding annually by having stuck to his chosen field!

The 80 million man-hours which the Program records is the amount of time required to build a symbolic sky-darkening fleet of 800 four-engined bombing planes. Now that less time is required to build a plane than a year ago, perhaps that 80 million man-hours has built a thousand such mythical sky "forts" which otherwise would not be over Sicily and other European key targets today.

Embarking upon its second year of activity under a somewhat different set of conditions, the Bomber Builders will concentrate mainly on getting war plants:

1. To get all the light possible out of present lighting equipments through frequent cleaning as part of a practical maintenance schedule;

2. To encourage cleaning of walls, ceilings and to use paint when needed;

3. To aid in the relocation of lighting equipment and/or machines, all with an eye to improving seeing conditions of the worker;

4. To exterminate glare both from daylight and artificial light sources;

5. To educate workers, showing them how they can help themselves to improve their own seeing conditions.

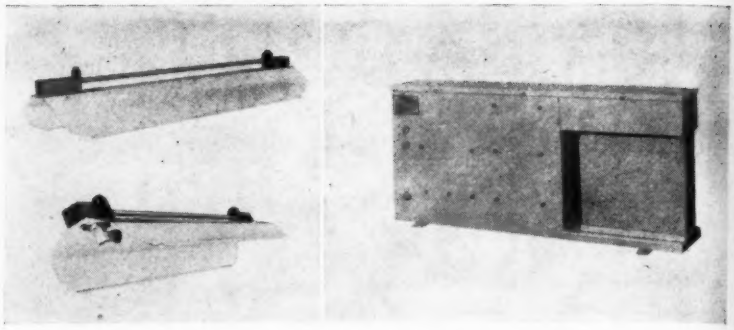
Restrictions have been put on materials which were available to lighting men in the past year. But being made of sturdy stuff, the Bomber Builders will doubtless turn in a more impressive performance in the year to come than they have just achieved.

Review of Wartime Lighting Equipment

(Continued from page 28)

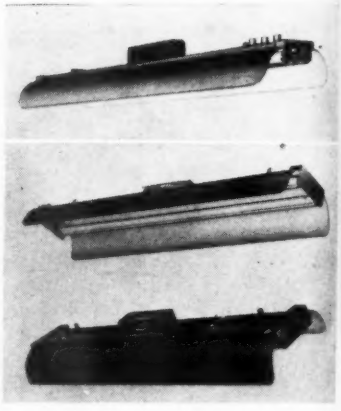
The ballast for the three kilowatt reflector for one lamp which is mounted remotely from it is shown in Figure 20. These ballasts weigh approximately 350 pounds, and must be securely mounted either to the ceiling or a post whenever this type of equipment is used.

Figure 21 shows the new Shallow Wireway Fluorescent Industrial unit as manufactured by the Curtis Lighting, Inc. It is available for either 40-watt or 100-watt lamps. The channel itself weighs less than 2½ pounds and therefore is well within the limitations established by the War Production Board. The reflector is of Masonite. The unusual contour



Left to right: Figs. 19 and 20.

Below: Figs. 21 and 22.



of the top housing gives this unit exceptional rigidity. The units are furnished with two brackets each with two holes for chain suspension. A sliding clamp hanger can also be used at any point between the ballasts and the sockets.

The Silv-A-King units, made by the Bright Light Reflector Company, Inc., specifically designed to conserve steel and other materials, are called "Victory" units. See Figure 22. One feature of this equipment is the rigid end-plates which act as bumpers to prevent sockets from being broken or forced out of position. The ballast is exposed and starters are located on the top of the channel. The reflector can be quickly detached from the hood by loosening two fibre thumb nuts.

Just what the future will bring forth, either before the war ends or after, we do not know. There are a great many materials worthy of consideration for use in lighting equipment. They are used at present in many other products, such as the food trays we use in cafeterias. It is simply a question of development to bring these products into actual use in lighting work.

Typical of the coordination of lighting and architecture is the matter of making long narrow stores look distinctively attractive. In this store, the architect has utilized the form of the lighting plus display ingenuity in the wall racks to work out an individualized appearance.

Postwar Lighting Trends

By James M. Ketch*

IF THE UNITED STATES government had told us five years ago that we were going to be in a global war in a few years and that lighting should be prepared to help fight the war to the limit, I dont think we could have been much better prepared than we were when the Japs struck at Pearl Harbor. We have lamps of high efficiency, in white, daylight, or colors; time and space-saving lamps that produce heat, germicidal radiation, sunlight, and fluorescent effects. We have 3000-watt lamps squeezed into a tube 1-3/16" x 55", and 1000-watt lamps the size of a cigarette. We have design data, efficient reflecting equipments, and installation experience with all of these sources. We know how to produce 100 fc. or more for factories and acceptable low brightness for blackout.

When you find you cannot get all the lamps you want for homes, stores, and electrical advertising, and they have taken away some of your photographic lamps, cut out the colored lamps, and eliminate many types and sizes of lamps you would like to use, you will realize as never before that "light has gone to war" with a vengeance.

When you and I were in khaki in 1917-1918, we sang "Keep the Home Fires Burning." The boys this year are singing "When the Lights Go On Again All Over the World." We cannot let them down, for they are expecting a better world to live in than ever before. That's what they are fighting for!

Just as surely as illuminating engineers and manufacturers of lamps and lighting devices were ready and waiting to apply lighting to war needs, so will they be equipped to fit lighting to peacetime needs. We, as lamp manufacturers, are often asked "How long will it take you to convert your factories to peacetime production?" The answer, figuratively at least, is "Just as long as it takes us to change the shipping labels on the lamp cartons." Most of our lamps built for lighting war factories are also well suited to lighting stores, offices, schools and homes.

The manufacturers of lighting equipment are now devoting practically all their manufacturing space and man hours to making industrial equipment. It is expect-

*Illuminating Engineer, Lamp Department, General Electric Company, Cleveland, Ohio. Adapted from an address before the Georgia Engineering Society, Atlanta, Georgia.

An exemplary office lighting system may be so unobtrusive that its influence is emphasized entirely at the work level. (Top) In this large general office the flush, fluorescent troffers have been so skillfully designed that the units seem to disappear as the eye looks down the ceiling from work positions. (Below) Another office installation demonstrating that large general offices can be uniformly lighted with comfortable levels of illumination from sources that seem to blend into the ceiling.

ed, however, that during the transition-to-peace period, when metals and man hours will be made available for civilian needs, the manufacturers will have machines and manufacturing capacity to absorb them as fast as released.

There is no prognostication today about the products of tomorrow: pre-fabricated houses, plastic automobiles, chemical fabrics, a helicopter in every back yard, rubberless tires, 100 octane gasoline, television, and other electronic devices galore.

Most of the descriptions of these devices are based on sound scientific facts coupled with a little inspired scientific crystal gazing and stimulated by some well-justified wishful thinking. Who is to say, "It cannot be done"? I am always inspired by C. F. Kettering's statement about the bumble bee: "According to the theory of aerodynamics, and as may be readily demonstrated through experiments, the bumble bee is unable to fly. This is because the size, weight and shape of his body, in relation to his wingspread makes flying impossible. But the bumble bee, being ignorant of these scientific truths, goes ahead and flies anyway and make a little honey every day." You can tell me almost any scientific fairy story and I, for one, would be very slow to pronounce it impossible.

Let us for a moment, however, get our feet on solid earth and face some practical futures in lighting. The trend will, I believe, gravitate toward light to live with —those plus values of beauty and comfortable seeing as well as efficient seeing.

The research activities of our company, like those of practically every other manufacturer, are now devoted entirely to the war effort. But like any other forward-looking business, we are beginning to think of our future and yours. Running as an undercurrent through all of this planning is the thought that our post-war lighting must be light to live with. Coupled with that, of course, is the need for lighting to continue expanding its utilitarian values and fitness for the practical needs of human beings.

As I see it, there are several characteristics that must be incorporated in the lighting of tomorrow in order that we can truly call it light to live with.

Lighting and Architecture

Architects are calling for a better coordination of lighting and architecture. This means that in new buildings there will probably be more built-in large-area coffers, troffers, and various types of coves. The architect is entirely justified in this request, but the illuminating engineer must see to it that the lighting also serves the purpose for which it was designed. We cannot lose now the gains in efficient seeing for which we have worked hard. As for the problems of relighting, there will probably be a trend in replacement fixtures toward those of the close-ceiling type which can be used either singly, or built into continuous lines or area patterns. Both the architects and consumers are asking for light without the necessity for such large and bulky suspended fixtures. Our package of light must be smaller! This could be accomplished by using fewer lamps having more lumens-per-foot incorporated in fixtures of better design and in many other ways. We trust that this can be accomplished without resort to methods using overly-bright fix-

tures that draw attention to the lighting system instead of the object lighted; in the factory the most important area to light is the work; in the store it is chiefly merchandise; in offices, drafting rooms and schools, it is mainly the table, desk top, or chalk board. In all of these, however, we must include in our thinking the desirable environmental factors of light and color on walls and surroundings.

More Color In Our Lighting

In color we have a new dimension in lighting not widely used heretofore because of the very inefficient absorption methods of obtaining it. But now we have sources producing colored light at efficiencies undreamed of a decade ago. Pure and saturated colors will probably be too strong for our tastes, but tints of light, like a pinch of salt in our soup, will make our lighted interiors more interesting. The mere flick of a switch will enable us to fit the color of our environment to our moods.

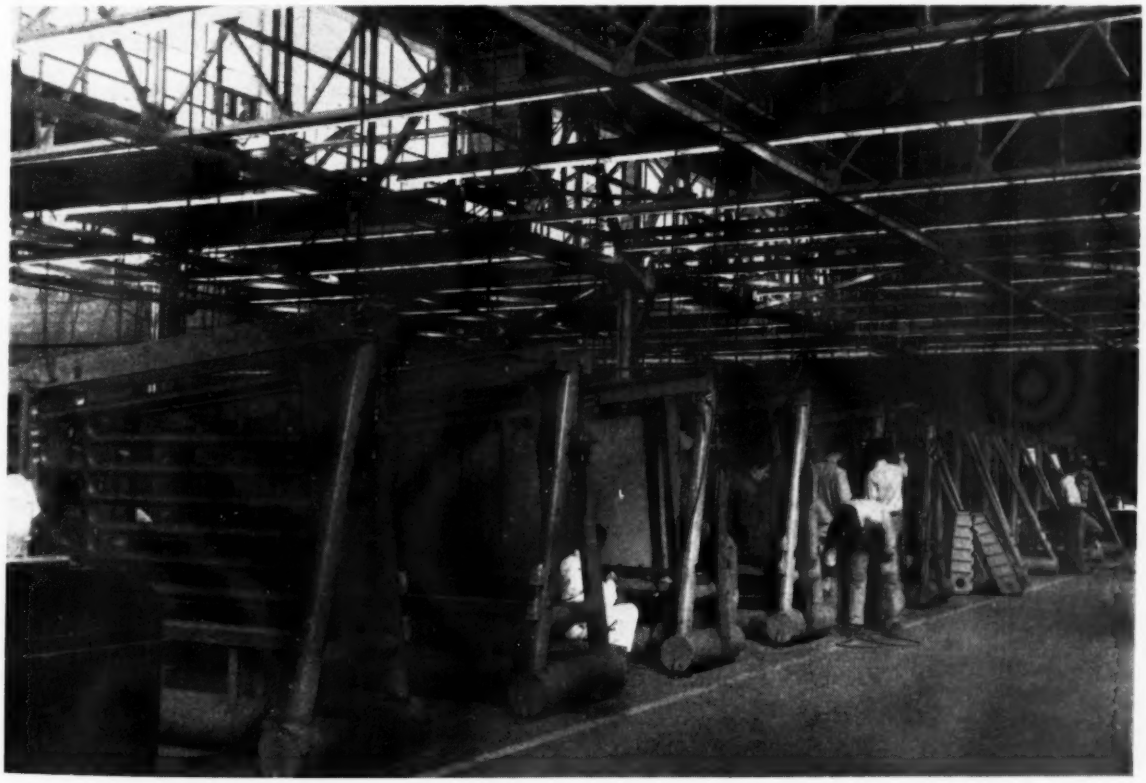
Probably other reasons for our general lack of interest in colored light have been our lack of understanding of color and the absence of practical design data on combinations of color sources to obtain the desired effects. Some progress has been made in practicalizing color design information, and I believe that we will have more complete data when we are again allowed to use colored light sources. The understanding and appreciation will come as color is more widely used.

A gesture was made several years ago on acceptable tinted sources in the form of the soft white fluorescent lamp. Listed as a colored lamp, it will be unavailable until after the war. When considering the colors and tints of fluorescent lamps to be available after the war, the lamp manufacturers will undoubtedly appraise carefully the light-to-live-with needs of the interior decorator and architect, the needs of the merchant and office manager, and the preference of average people.

The limits on efficiency of incandescent lamps are well defined and, in the light of our present knowledge, the economics of sizes of fluorescent lamps indicate diminishing returns for lamps of higher wattages. Following the pattern of incandescent lamp development, we are at the point of horizontal development of fluorescent lamps to better fit them to specific needs. As in the case of incandescent lamps, this lateral development calls for a balancing of sacrifices in efficiency against gains in net light output, or attainment of desired physical characteristics or dimensions.

The Lamps of Tomorrow

Although further gains in efficiency of incandescent lamps are improbable, their possibilities for diverse applications are broad. In addition to their low cost and simplicity of operation, their versatility in matters of lumens per cubic inch of lamp bulb, small filament size for focusing and optical systems and latitude of bulb



Warplane production has required such a tremendous expansion in so short a time the aeronautical industry has set its standards for lighting high. It has done this for the same objective that has influenced its general plant efficiency in other factors, i.e., the maximum production that men and machines and management can devise.

Textile mills have provided one of the most receptive industrial fields for advanced lighting methods. Few industries have seeing problems requiring more careful consideration, and lighting design has developed a repertory of specialized applications in this field. Here is a typical, modern lighting installation of continuous row troffers equipped with fluorescent lamps. All critical seeing jobs are uniformly accomodated.

shape should not be overlooked. Incandescent sources cannot compete with gaseous discharge sources on efficiency, but they will probably continue to dominate the field in many other ways.

Like anyone else, we would like to eliminate the ballasts, but they are necessary element in any arc source whether it be mercury, carbon, hot or cold cathode.

There are many ways of starting a fluorescent lamp, and, therefore, there is more hope for eventually eliminating the starter. For general purposes, and for the duration, the present hot-cathode and starter combination seems to us to be the most suitable because of lamp life and the necessary conservation of critical materials which are necessary for other methods of starting.

Until recently, high-voltage cold cathode light sources were not made in standard units. Accordingly mass-produced hot-cathode standard Mazda F sources were more adaptable for general lighting, and the cold-cathode sources found their logical application in custom-built lighting. The trend toward standardization of cold-cathode units will broaden their application for general illumination.

Trend In Specific Fields

Industrial—It is estimated that with the excellent lighting in all of our new war plants and relighted old plants, industry is today but a fourth well lighted. Also the new high-level jobs have proved what many of us have long felt: even though overhead general high-level lighting is basic, and the first requisite of a good system, used alone, it falls short of being completely adequate for many industrial processes. We will probably see an increasing number of well-designed, custom built lighting devices for close-up or plus lighting which are designed to meet some of the unusual requirements of diffusion or position, or to produce footcandle values that are not easily obtained from general lighting alone.

In the design of industrial lighting reflectors and systems, some sacrifice has been made in visual comfort in order to obtain high reflector output and utilization, and the lowest cost of footcandles. With the availability of higher-efficiency light sources and generally lowered lighting costs, we can well afford to raise the standards of visual comfort in our factories and approach those established for commercial purposes. One cannot overlook the importance of controlled environment pioneered by one large industrial plant designer, and quite generally adopted in principle by all leading designers. Controlled environment, of which high-level

(Continued on page 82)

Electric Institute Plans Service Training Program

THE ACUTE shortage which has developed in electric refrigeration mechanics, making it necessary for service organizations to turn down repair jobs because there are not enough trained men, has prompted the Electric Institute of Washington, to make a survey of the manpower available for this work. Steps have been initiated to insure that trained servicemen now available will be permitted to stay on their jobs so that they can take care of the service needs and train other men mechanically inclined, who will be made ready to take over the repair work as rapidly as possible.

The Electric Institute of Washington is a non-profit agency, organized in 1934, whose membership includes most appliance selling dealers, department stores, specialty appliance retailers, servicing agencies, furniture and hardware stores, wholesalers, manufacturers, contractors and others interested in the sale or repair of electrical appliances and equipment.

Prior to the war, the Institute functioned primarily as a promotional agency through which the public was educated to the increased use and care of electrical equipment and through which the industry was educated through sales training programs, merchandise campaigns, etc.

Under the present wartime conditions, the Institute is primarily concerning itself with helping its membership in the effort to maintain existing equipment in operating condition.

It was to this end that it concerned itself in making a survey of the service manpower situation.

This study showed that 60 per cent of the full-time manpower was employed in repair agencies which were members of the Electric Institute. In some fields of repair work, this percentage was considerably larger. Seventy per cent in the field of domestic refrigeration; 87 per cent in electric washers, and approximately 50 per cent in electric motor repair shops.

It is pointed out that electric appliances and equipment repairs are essential to civilian economy. The importance of maintaining existing electrical equipment in proper operation has been recognized by WPB in the allocation of critical materials for the manufacture of repair parts. The War Manpower Commission and Selective Service have recognized the importance of maintenance of existing equipment and have established that field as an essential occupation.

Impressive Number of Appliances

The importance of electric appliances is reflected in the following equipment which is contributing to the safety and health of 215,000 families in the Washington area—particularly at this time when the war demands the highest in efficiency for every worker:

175,000 electric refrigerators conserve health and food;

24,000 electric ranges conserve essential vitamins and minerals.

295,000 home radios, essential to war information, civilian defense and morale;

77,000 washers save time and energy and promote health;

203,500 hand irons are essential to present living standards;

125,000 vacuum cleaners do twice the job in half the time as compared with the old-fashioned methods of controlling dirt;

45,000 electrically operated and controlled central heating plants are necessary to health and comfort.

In the commercial field, the example of electric refrigeration is sufficient to indicate the importance of electrical equipment.

The survey of repair agencies indicated a very serious decrease in the manpower available for appliance and equipment repairs. Demands for these technically trained men have been very great, both from the armed forces and from war industries. As a result, a very large number of these men have left the industry. The percentage of decreases in available manpower varies among the different types of repair service, with the largest percentage of decrease occurring in the repair devices most essential to the civilian economy, it was pointed out by the Institute.

The full-time manpower in the the domestic refrigeration field is considerably less than it was at the peak season in 1941. And in the field of motor repairs, which is the basis for many other services, particularly commercial refrigeration, oil burners, washers, elevators, etc., the decrease in manpower approximates 50 per cent.

Not only has a significant percentage of its experienced manpower been lost, but there has been a very large turnover of men in repair agencies. The turnover in recent months has been over 30 per cent, with the armed forces and war industries bringing this about by their urgent demands for these servicemen. It is estimated that effective manpower in essential electric appliance and equipment repairs has been reduced by at least 50 per cent.

In normal times, a very sizeable percentage of new appliance sales represented replacements of devices already owned by the purchaser of the new appliances. The estimated percentage of sales replacing other equipment in the Washington area were 40 per cent on electric refrigerators, 25 per cent on washing machines, 70 per cent on vacuum cleaners. With no new appliances and equipment available for existing occupancies, it is obvious present equipment which formerly would have been traded in on new devices must now be kept in repair. This condition has resulted in a tremendous increase in the volume of repair business in all lines of appliances and equipment.

Service Volume Up 22%

The survey showed that there was a 22 per cent increase in appliance repair volume over the previous year, and with no new appliances available, there is little doubt but that the repair volume will increase at least 50 per cent by the end of 1943.

In other words, if all present servicemen now employed in the Washington area could be retained for the balance of 1943, the industry would be in a position in which it would be forced to handle a 50 per cent increase in volume over that handled in 1941 with approximately one-half of the effective

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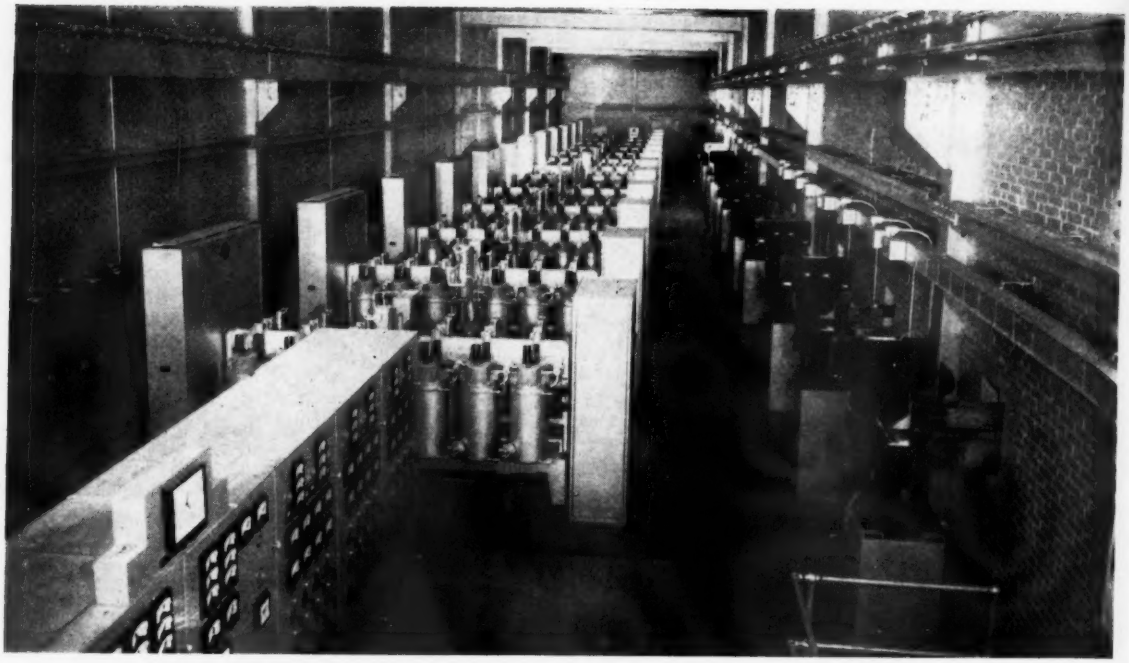


Fig. 1. A 12-unit 40,000 kw Ignitron mercury-arc rectifier installation.

Electronics in Industry

By E. H. Alexander*

ONE DOES NOT have to be a research physicist, an electrical engineer, or even associated in any way with the scientific professions, to be definitely conscious of the prevailing wave of publicity on "Electronics." Indeed, every type of publication from the technical journals and trade papers down through the popular scientific, and general magazines, has featured this subject as a great, nebulous post-war promise of things to come.

What is this thing called "Electronics"? There will be as many answers to this question as there are answerers, but a simple definition is this—"The science of controlling electricity which has been freed from the boundary of conducting wires."

No matter how fantastic the electronic world of tomorrow may be, we have behind us about fifteen years of genuine industrial achievement in the electronic art.

The future of industrial electronics is none the less bright because of this experience. However, my remarks are directed toward accomplishments of today, rather than a promise of tomorrow.

At present there seems to be a rather broad and natural division of the subject of industrial electronics along functional lines as follows:

1. Large power conversion and inversion equipment.
2. Electronic sources and electronic control of industrial heating.
3. Electronic control for resistance welding.
4. General purpose electronic control for power utilization devices, processes, measurements and instrumentations.

Let us take a cross-sectional view of these four major divisions in the order stated above.

Large Power Conversion and Inversion Equipment

There is already installed in this country approximately 3,000,000 kilowatts of rectifier equipment, and it has been estimated that 10 per cent of all the kilowatt hours generated in the whole country this year will pass through these electronic devices. Of course, the electrochemical industries have been responsible for the tremendous expansion in the use of these electronic devices. The electrolytic production of aluminum and magnesium to meet the war-time requirements consumes great quantities of direct current energy.

The large equipments with their accessory transformers and switchgear are pumped ignitron rectifiers, such as shown in Fig. 1. This picture is a view of a large installation amounting to 40,000 kilowatts of direct current energy, for the production of aluminum.

For ratings below 500 kilowatts at 250 volts, the sealed ignitron rectifier has permitted the introduction to industry of an entirely new system of d-c distribution and utilization by bringing high voltage a-c power to the load center and converting this power to the

*A talk presented before the Industrial Power Committee of Southeastern Electric Exchange, Atlanta, Ga. Mr. Alexander is an engineer in the Industrial Control Division, General Electric Company, Schenectady, New York.

d-c utilization voltage. Such a unit, coupled to a transformer and assembled integrally with a protective, regulating and feeder equipment is shown in Fig. 2.

A close-up view of the rectifier section only, of Fig. 2, is shown in Fig. 3 which shows six sealed ignitron rectifiers in the left-hand portion of the cubicle structure and the regulating portion in the lower center of the picture. Air circuit breakers for protective and feeder equipment occupy the rest of the space in the completely metal enclosed cubicle. Future markets for power conversion equipment will find the electronic rectifiers an established performer.

In the field of large power frequency changing which really involves conversion and inversion, there will be shortly put into operation an electronic frequency changer, rated 20,000 kilowatts. This frequency changer will tie together a 25-cycle and a 60-cycle power system and will permit the control of the direction and quantity of power exchanged between the two systems, regardless of frequency fluctuation of either system. This is a pioneering development, but the future of this type of equipment, or modifications thereof, may change the whole complexion of the rotating apparatus field.

Electronics in Industrial Heating

Above the frequency ceiling of 12 kilocycles, now obtainable by rotating machinery, there has been installed many kilowatts of a-c power at 500 kilocycles, using electronic tubes as the power oscillators. These sources of power are primarily used for the inductive heating of metals. Dielectric heating shows great promise for heating of non-ferrous metals and organic solids, such as plywood and synthetic resin. This is already being done and requires frequency in the range of 3 to 10 megacycles.

Fig. 4 shows a typical 5-kilowatt, 550-kilocycle electronic heater with a table including heater coil and quench-ring fixture attached. A small gear is being inserted in the heater coil of the electronic heater shown in Fig. 5.

Experimentation in the frequency range of 200 kilocycles to 30 megacycles may unlock the answer to a considerable number of industrial problems.

In the control of the resistive type of industrial heating furnace, electronics have played an important part. Utilizing saturable core reactors and electronic control to provide automatic throttling of the power input to the furnace, extremely accurate control of temperatures may be obtained. As early as 1938 installations of "Reactrol" were made on such services as steam super-heaters, electric heat treating furnaces, chemical process plants, and in laboratories. Single installations ranging from 3 to 3,000 kva, with as much as 312 kva operated from a single control have been made. Electronic control of saturable core reactors (Reactrol) is now used in the testing of aircraft engines, in the manufacture of nylon, in the annealing of range finder lenses, in the heat treatment of metals, and in many chemical processes.

A typical installation of Reactrol with its associated furnace is shown in Fig. 6. The schematic

Fig. 2. A sealed Ignitron mercury-arc rectifier with transformer and d-c feeder switchgear. A complete d-c load center substation.

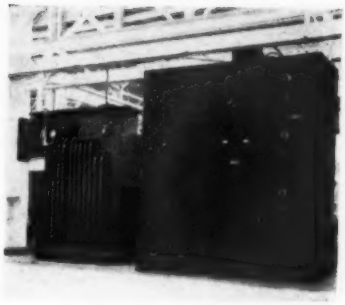


Fig. 3. The sealed Ignitron rectifier tubes of d-c load center substation shown in Fig. 2. D-c voltage regulator and regenerative control in lower center.

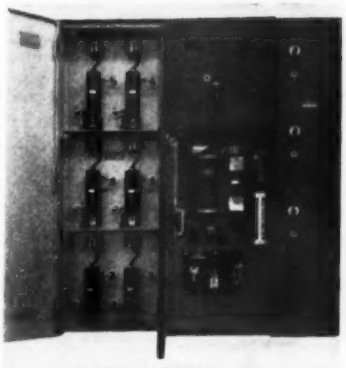


Fig. 4. A 5-kw electronic heater for induction heating of metal parts.

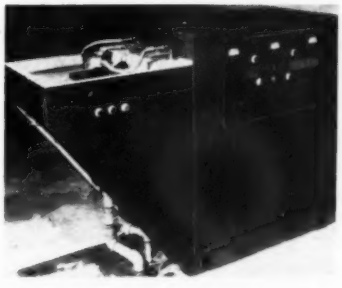


Fig. 5. Work being inserted in heater coil of electronic heater. Also shows quenching ring fixture.

Fig. 6. Box-type electric furnace with air re-circulation. Electronically controlled by Reactrol shown on panel at left.

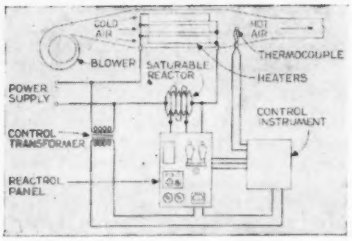


Fig. 7. Schematic wiring diagram of electronic heat control for furnace shown in Fig. 6.

Fig. 8. Electronic control panel for use with saturable reactor to control heat input to furnace shown in Fig. 6.

arrangement of the electrical circuit is shown in Fig. 7 and the electronic portion of the system which supplies controlled direct current energy to the saturable core reactor is shown in Fig. 8.

Electronic Control of Resistance Welding

No single industrial application of electronics has contributed more to the war effort than those applications controlling the flow of electric power to resistance welding machines. Approximately 4,000 electronically controlled equipments for resistance welding have been produced during the past year, and their value as a tool for the fabrication of fighting equipment is well known. The use of aluminum-bearing alloy sheet is not expected to cease after the war, and thus the use of electronic equipment to improve its fabrication is expected to expand. More recently the welding of high carbon steel offers another considerable extension for the use of electronic equipment.

The day may come when large structures such as buildings and ships will be fabricated by resistance welding instead of arc welding. It is now possible to employ any technique for welding, annealing, and tempering a metal-to-metal joint in any desired sequence of controlled operations. Fig. 9 shows an electronic sequencing panel for controlling the heat and the length of time of a multiplicity of welding, cooling, annealing, and tempering sequences.

The power supply is of paramount importance in the maintenance of weld quality. Variations in the voltage of the power supply make it difficult to maintain consistent quality of welds under a variety of welding conditions. For that reason electronic voltage compensating means for regulating the voltage at the welding transformer offers one solution; with this type of equipment it is possible to improve greatly the consistency of welds even from power supplies which are inadequate to maintain closely regulated voltage.

Whenever magnetic materials are moved in or out of the throat of a resistance welding machine, the resulting change in impedance causes a corresponding change in the welding current. In order to eliminate this change in current a compensator known as the "current regulating compensator" makes automatic adjustments for the variations in impedance, or changes in line voltage, and tends to hold the welding current constant regardless of these variations. Fig. 10 shows one of these current regulating compensators installed in conjunction with an all electronic control panel and its associated resistance welding machine. The compensator is shown mounted above the main control panel in the upper right-hand corner of the equipment.

Fig. 9. A sequence control panel for program timing and heat control of a resistance welding machine. Electronic timing does it.

An interesting and important application of electronically controlled resistance welding is shown in Fig. 11. This figure shows the fabrication of a streamlined railroad passenger car.

General Purpose Electronic Control

The great number of successful applications in this functional division of industrial electronics would require individual treatment to do it justice. We can only pick a few examples in this group to show the versatility of electronics. In fact, in many modern equipments electron tubes are now the only line of communication between those tiny amounts of energy which tell of certain conditions existing in some process requiring control and the brute force conventional control.

Here, the electronic tube lends a helping hand in a noiseless, high speed, inertia-less manner to those signals so weak as to be incapable of use by conventional control, by amplifying them to usable levels where conventional control can take over.

One of the recent important improvements has been in the elec-

HERE'S SOMETHING NEW! Something every electrical contractor and maintenance man should know about. Synthetic Insulated Wire and Cable—produced by Walker of Conshohocken!

The new insulation has many desirable properties. It is tough, flexible and long-aging. It is heat resistant and fire resistant. And—best of all!—it is unaffected by oils, alkalies, acids and moisture!

Walker "Synthetic" may be had in all standard colors—black, white, red, blue, yellow, green—and in other colors on request. What's more—these colors won't scuff off! Sizes range from small diameter building and control wires up to large circular mil. cables.

Write for the sample card which explains features and lists suggestions for use. Walker Brothers, Conshohocken, Pa.

Note—Current WPB regulations on priorities for copper wire apply also to Walker "Synthetic".

WALKER Conshohocken

Manufacturers of UNDERFLOOR DISTRIBUTION SYSTEMS; RIGID STEEL, FLEXIBLE AND TRIM WIRE RACEWAYS, RUBBER INSULATED WIRES AND SYNTHETIC WIRES AND CABLES; SERVICE ENTRANCE AND NON-METALLIC CABLES

tronic control of d-c motors for wide range, adjustable speed drive (Thy-mo-trol). The control of d-c motors by supplying power to them from a controlled electronic rectifier is not a new art, for such equipments were in successful use before 1928. However, certain improvements in current limit regulation to the armature circuit, together with automatic armature IR drop compensation have led to a much improved co-ordinated rectifier equipment, making it possible to take advantage of the versatile d-c motor from an a-c power supply. With the motor, this equipment makes the unique adjustable speed drive offer several outstanding features heretofore obtainable only by sometimes cumbersome and expensive means.

This wide speed range, stepless electronic controller provides for starting, stopping, dynamic braking, constant current acceleration to a preset speed point and, where required, reversing by the addition of standard magnetic reversing contactors. A simple, single dial, speed control unit varies armature voltage for speeds up to basic speed, and field current with speeds above basic, so that it is possible to operate the motor over its entire available speed range. The current limiting characteristic permits the motor to accelerate at the maximum possible rate without overloading either the motor or control. Once the speed has been pre-set the system provides closely regulated armature voltage and compensation for armature voltage drop, with the result that the speed is held very closely to constant speed, independent of the load and ordinary line voltage variation.

Figs. 12 and 13 show the electronic control panel and its separately mounted control push button station complete with speed selecting potentiometer. Because of its physical arrangement, such a packaged electronic equipment adapts itself, particularly, to built-in applications for the machine tool industry. Such an application is shown mounted on a machine in Fig. 14.

Only the motor of this Thy-mo-trol drive contains rotating parts, and in many machine tool applications this reduction in vibration is highly important to the quality of the finished work.

Many industrial processes require the measurement and control of heat energy. Since temperature itself cannot be measured directly, it is one of the more difficult physical properties of matter to measure, especially when the location of the body to be measured is in an inaccessible location. Photoelectric tubes are especially suited as measurers of radiant energy from bodies heated to a temperature value where visible energy is radiated.

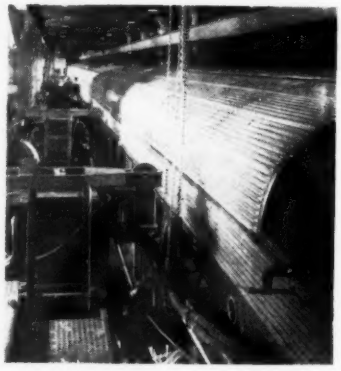


Fig. 11. Stainless steel railroad cars being fabricated by resistance welding, electronically controlled.

Let us take, for example, the manufacture of Portland cement. Here raw materials are "burned" or "clinkered" in large rotary kilns where the maximum temperature required of the material is about 2750°F. The fuel combustion temperatures are over 3000°F, so that correct and economic clinkering necessitates control of the time the materials are exposed to the flame, as well as the maximum temperature attained by this clinker.

Inaccessibility of the clinkering zone to normal means of actually determining temperature led to the consideration of the photoelectric tube as a means of detecting and controlling clinkering temperature. The high rate of response of this electronic device and the range of temperatures used, permits the most accurate and rapid detection of temperature changes.

A photoelectric tube arranged in a light-tight housing such as shown in Fig. 15 with its complete optical system is focused to produce an image of the hottest spot of the clinker bed on the sensitive phototube. The variation in the output electrical energy of the phototube is quite small, and is amplified on a photoelectric pyrometer panel, such as shown in Fig. 16. This panel is designed to minimize the effective changes of line voltage, change in tube characteristics with age, and other disturbing features on the calibration of the instruments.

Moreover, independently adjustable control points for both the "hot" and "cold" direction of operation are provided. Not only is the speed of the kiln controlled to regulate the time of exposure of the clinker to the flame, but a record of kiln speed in revolutions per hour, as well as temperature, are recorded simultaneously on a strip chart recorder.

A typical installation to ten rotary cement kilns is shown in Fig. 17. The photoelectric tube and its optical system is focused to "look" through a small hole in the kiln hood. The photoelectric tube may be seen mounted on a vertical pipe support in the center of the picture. (See circle.)

The completely automatic charging of storage batteries is equally important to the industrial and public utility field By using electronic tubes as a controlled recti-

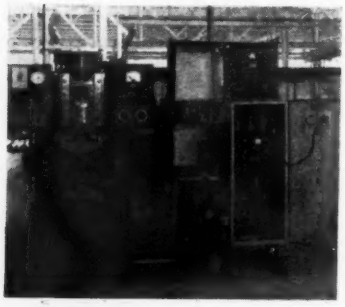


Fig. 10. A spot welding machine complete with electronic control and current regulating compensator.

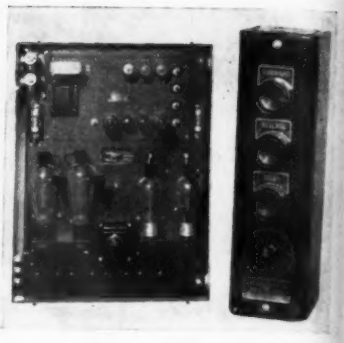


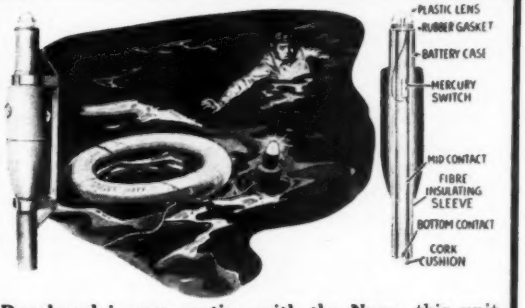
Fig. 12. (left) Thy-mo-trol rectifier panel for a 1-hp, d-c motor. Provides variable voltage to both armature and field. Fig. 13 (right) Separately mounted push-button station with integral speed adjusting means for motor control in Fig. 12.

NEW Wakefield COMMODORE
INDUSTRIAL UNIT

When you're lighting or relighting industrial areas, let these facts help you

- New COMMODORE Industrial unit gives 86% of light from bare bulb . . . 75% down on the job . . . by E.T.L. test.
- Plaskon reflector means light weight.
- Only 13 oz. of steel . . . helps WPB conservation.
- Gives light up, as well as down.
- No dark ceilings; no eyestraining contrasts.
- One of the most efficient industrial units known.
- Easy to clean . . . easy to handle.
- For lamps from 200 to 500 watts.

Write for details



Developed in cooperation with the Navy, this unit made by Wakefield provides important help at night . . . for those accidentally hurled overboard or to flyers down at sea. It lights up when it hits the sea and locates life saving equipment in the dark.

For outstanding war production . . . made possible through the untiring efforts of our men and women who make equipment which has helped save fighting ships and men.

ARMY E NAVY

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RED SPOT LIGHTING FOR COMBAT OPERATIONS AND WAR PRODUCTION

VERMILION, OHIO

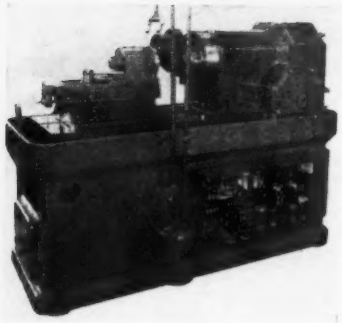

Fig. 14. A modern machine equipped with wide speed range electronic motor control. (Thy-mo-trol).

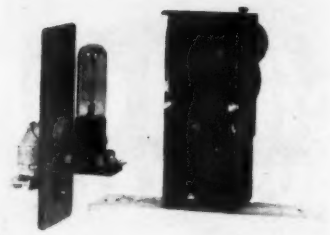

Fig. 15. A dust-tight phototube holder, complete with optical system showing back cover removed with phototube in place.

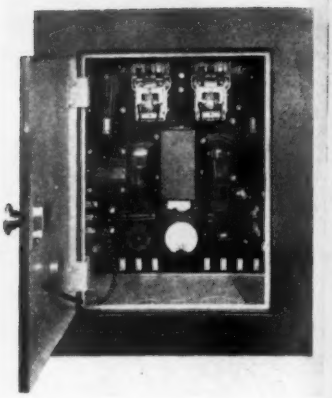

Fig. 16. Electronic amplifier of photoelectric pyrometer with 2-point control. Amplifies output of phototube shown in Fig. 15.

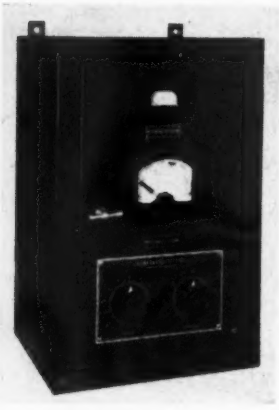

Fig. 18. An all-electronic battery charger with complete voltage regulation and current limit features.

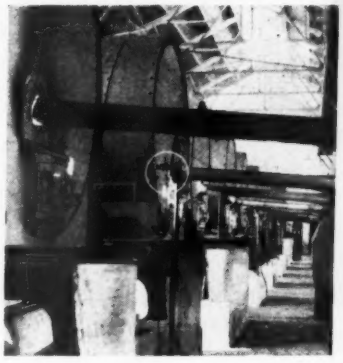

Fig. 17. Ten rotary cement kilns under the control of photoelectric pyrometers. (One photoelectric tube shown in white circle.)

tier, with other accessory tubes as an electronic regulator, an adjustable, self-regulating phanotron rectifier has found wide application. Usually used for batteries operating at 120 volts or higher, these electronic rectifiers will automatically charge the battery according to the requirements governed by its discharge rate, regardless of whether this is a continuous, variable, or intermittent duty. The unique voltage characteristic of this equipment gives an essentially flat voltage characteristic from no load to full load, and then breaks abruptly into a relatively constant current characteristic. Independent adjustment of current limit setting and voltage are obtained by small potentiometers shown on the front of panel in Fig. 18.

The complete rectification and voltage regulation of this equipment is electronic, thereby eliminating the use of moving parts. On an attempted reversal of current, it is self-protecting, thus eliminating the necessity of reverse-current protective devices.

Conclusions

In view of the tremendous amount of electronic promises of the future which are now rampant, it becomes essential to face certain facts. Electronic devices for a given current rating will probably always have an inherent cost greater than that of a single-pole knife switch. If the knife switch will do the job, it is not a sound application to propose the electronic device for the job.

But if the knife switch cannot do this job quickly enough, if it wears out too quickly, if the action is not precise enough, or the open arc is objectionable, then we may begin weighing the extra cost of electronics against the better performance obtained.

With the intelligent choice of industrial application and sound application engineering, the future of industrial electronics can be very bright.

Electronics At Work

The fundamental principles of the six basic ways in which electronic tubes function are explained in a new 36 page booklet announced by Westinghouse Electric and Manufacturing Company.

Schematic drawings of the tube construction and diagrams showing the typical circuits for the various functions are used to explain how electronic tubes rectify, amplify generate, control, transform light into current and current into light. Industrial and military applications for each of the six basic functions are described and illustrated in this booklet, "The ABC of Electronics at Work." High frequency heating, dynetric balancing, resistance welding control, radio and radio-telephony, television, Precipitron, industrial and medical x-ray are a few of the electronic devices that are included.

A copy of booklet B-3260 may be secured from Department 7 N 20, Westighouse Electric and Manufacturing Co., East Pittsburgh, Pa.

Primer on Electronic Tubes

A 24-page nontechnical book titled "How Electronic Tubes Work" has been produced by the General Electric Electronics Department at Schenectady, N. Y. It is designed primarily for industrial engineers. Illustrated with 117 sketches and photographs, the book is a primer whose main emphasis is on how the electronic tube operates. Basic tubes are described. The book (GEA-4116) is free on request to General Electric Co., Schenectady, N. Y.

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THE NEW "MEGGER"* INSULATION TESTER . . .

a worthy addition to the famous "MEGGER" family!

With our Philadelphia factory now in full production, your needs for "Megger" Insulation Testers can soon be met.

Our new U. S. models are of the same general design and are similar in every way to our well-known "Meg" and "Super-Meg" Insulation Testers, except that they are housed in plastic molded cases instead of aluminum. All internal parts are made to the same proven design and specifications as the "Meg" instruments,—without compromise or substitution of materials. The cases are of high impact strength plastic,—one of the strongest, toughest molding materials available.

The entire instrument is built in our own plant by men and women who know how to make fine instruments. Our production is independent of the products of other instrument manufacturers.

We are fully confident that you will find these new Insulation Testers worthy members of the famous "Megger" family, and we invite your orders for them. At present we are offering ranges up to 100 and 1000 megohms with 500-volt generators. We continue to supply various other types and ratings of "Megger" instruments as formerly. Write for new descriptive Bulletin 1735-O.

MADE IN U.S.A.

- HAND-CRANKED GENERATOR
- DIRECT-READING OHMMETER
- SIMPLE
- RUGGED
- RELIABLE

*Trade Mark Reg. U. S. Pat. Off.

JAMES G. BIDDLE CO. · 1211-13 ARCH STREET · PHILADELPHIA 7, PENNA.

Wartime Lighting Counselors Break Production Bottlenecks

Drafting Room Light Problem Solved With Cold Cathode

By I. R. Webre
New Orleans Public Service, Inc.

THE INITIATIVE, ingenuity, and resourcefulness of Higgins Industries, Inc., is exemplified by the recently completed installation of cold cathode lighting in their new drafting room. In this drafting room is performed all the intricate details of design required in the construction of medium cargo vessels, PT boats, and tank lighters which are fabricated on a 24-hour a day basis in this progressive shipbuilding plant.

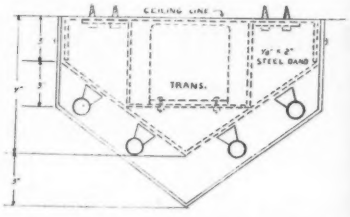
Milton L. Levy, electrical superintendent of the plant, as well as the plant management, is thoroughly convinced that adequate lighting is essential if speed and accuracy are to be secured.

The accompanying photographs show one section of the drafting room and a closeup of one of the fixtures. This represents approximately one-third of the total drafting room area but is typical of the entire room.

Continuous rows of units on 7′ 6″ centers are mounted at the ceiling, which has a height of 10′ 6″ with the exception of those locations beneath air conditioning ducts where the ceiling height is 9′. A feature of the installation is the use of a 3-phase, 230-volt distribution system with one row of fixtures on each phase so as to eliminate stroboscopic effect.

The close-up view and detail drawing indicate the simple type of fixture construction. There is 32′ of 1″ diameter FLA 3500° white tubing on each fixture. In locations where three fixtures are connected on one transformer, the transformers are rated at 12,000 volts, 120 milliamperes, 720 watts. Where two lighting units are connected on a transformer, the transformers used are 9,000 volts, 120 milliampere, 595 watt units. All transformers are of the high power factor type.

The lamps in this section of the drafting room have been in operation approximately 300 hours, and lightmeter readings taken directly beneath the low units indicate 65 footcandles, with 55 footcandles between rows. Draftsmen working in this area state there is no objectionable direct or reflected glare and no sharp shadows.



This equipment was fabricated and furnished by Industrial Electric, Inc., of New Orleans, and the installation was engineered by Higgins Industries.

Close-up of cold cathode fixture. At right, a cross section of fixture.

Venetian Blinds Help Machine Shop Lighting

By Howard L. Plahn
Houston Lighting & Power Co.

THE Schlumberg Oil Well Survey Co., of Houston, Texas, specialize in delicate well survey equipment, as their name implies, and also do some delicate machine work for Uncle Sam that

MITCHELITE

GREATER FLEXIBILITY

than ever before in Fluorescent Fixtures for War Industry

Provides for Every Method of Mounting and Hanging

The New MITCHELITE Design is amazingly simple and flexible. It can be used for every type of installation in factory, office or drafting room. Wide range of low-cost accessories and fittings, designed to save time installing and servicing, provide for every conceivable method of mounting or hanging. FOUR "LIGHTWEIGHT" MODELS —2-light and 3-light units using 40-watt lamps—a 2-light unit using 100-watt lamps —and a 2-section unit for four 100-watt lamps. Each model can be used for both individual and continuous row lighting, for surface or suspension mounting.

CHAIN SUSPENSION (with Flexible cable)

LEVOLIER SWITCH (with pull chain)

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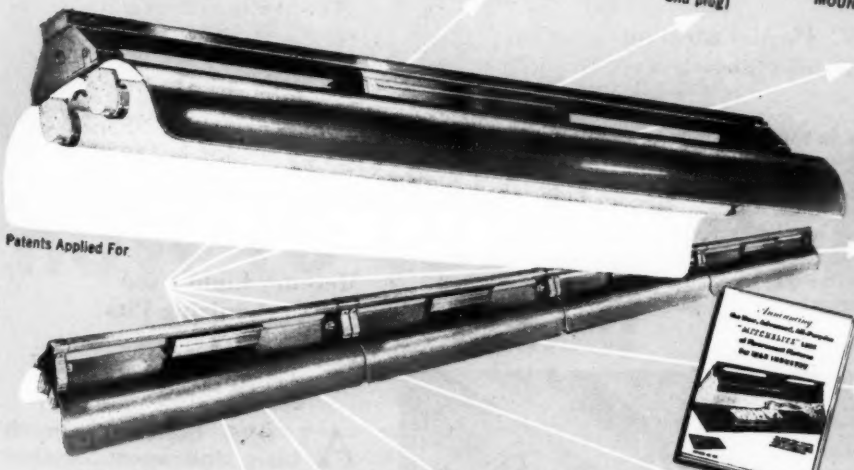
CONDUIT STEM MOUNTING

SURFACE MOUNTING (Continuous Rows)



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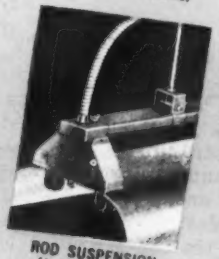

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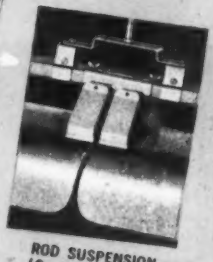
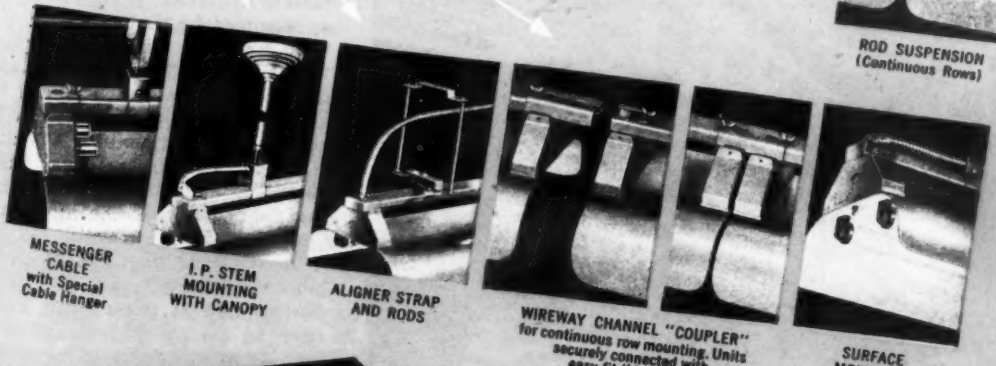


ROD SUSPENSION (Continuous Rows)



MESSENGER CABLE with Special Cable Hanger

I. P. STEM MOUNTING WITH CANOPY

ALIGNER STRAP AND RODS

WIREWAY CHANNEL "COUPLER" for continuous row mounting. Units securely connected with easy-fit "Coupler"

SURFACE MOUNTING (Individual Unit)

MITCHELL FLUORESCENT

MITCHELL *Manufacturing Co., 2525 Clybourn Ave., Chicago*

must remain secret for now.

Their lighting problem was due, in part, to their trying to save space by moving their machine tools close to the outer walls of the building, with the machine operator facing the window. The old lighting system consisted of 200-watt incandescent R. L. M. fixtures spaced on 15 foot centers and mounted 13 feet high.

A light meter check-up revealed that the light given off by the incandescent lamps was hitting 75% of the machinists on the back of the head, and, in their shadows, where the work was performed, there was only three footcandles of light. On a bright day, the lathe operator, with his lathe next to the window, had plenty of light directly in his eye and on the other side of his work—a seeing condition that could hardly be made worse.

To overcome these discouraging working conditions, the Houston Lighting & Power Co. submitted recommendations calling for venetian blinds on all outside windows, with the slats tilted at an angle to reflect the incoming sunlight up toward the ceiling rather than into the workmen's eyes.

The old incandescent fixtures were removed and replaced with a two 40-watt tube fluorescent fixture over each machine, mounted seven and one-half feet high and providing 40 footcandles of soft, comfortable light on the work.

The foreman of the shop states that the consumption of aspirin tablets by workmen has been materially reduced and work output stepped up!

Prismatic Reflectors Adapted To Machine Shop Lighting

By W. P. McCutcheon
Birmingham Electric Co.

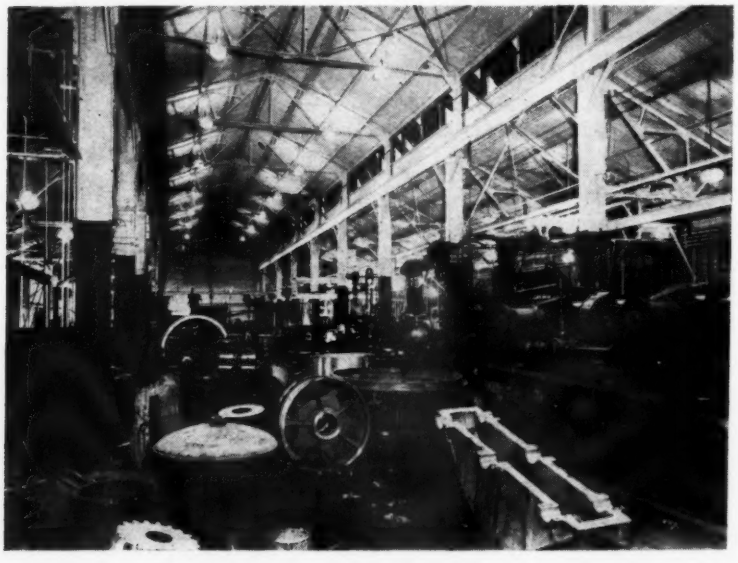
THE BIRMINGHAM area is the only place in the country where all resources needed in the manufacture of steel are available at one spot. It follows that local industries should be most valuable to the country as heavy producers of ordnance materials. Like other sections of the nation, most plants had to convert existing facilities to meet wartime needs. Lighting was among the things which received careful attention.

One illustration where effective measures were taken is shown in the photograph of the Chas. C. Steward Machine Shop. This is an independent machine shop specializing in subcontract work for other industrial plants. Extending working hours into the night and machining to close tolerances made it necessary to improve the seeing conditions.

Two steps were taken towards this objective. First, a complete new lighting system was installed using mazda "C" lamps in prismatic reflectors for both high and low bay areas. Second, a new paint job was given the interior, which increased the efficiency of the new system and provided better working surroundings.

The interest connected with this installation is that it is typical of hundreds of small plants (15,000 sq. ft.) throughout the country. It grew from a very small shop at its beginning to its present size by progressive small steps. Lighting improvement had not kept pace with other progress. Bare lamps, miscellaneous obsolete reflectors spotted here and there were in use when war ceme.

The new system measured in excess of 30 footcandles when the work described had been completed. Better workmanship, fewer rejects, increased production and improved working conditions resulted from these changes. It typifies the type of service trained lighting men have rendered in furthering the war effort.



Prismatic reflectors and new paint job improved seeing in this shop.

Mercury Light Used For Carbonizing Pits

By Frank E. Keener
General Electric Company

AT ONE important aircraft base, instrument workers were having difficulty making adjustments at bottom of certain meters enclosed in aluminum can approximately 3" diameter and 8" deep, painted black inside. Each worker had a 500-watt glass steel diffuser 4 ft. above his head but still had to walk to a window for certain adjustments. Constant room temperature was necessary, requiring additional air conditioning on account of the high wattage lamps.

Tests with daylight, with an empty instrument can, proved 200 footcandles at top of can necessary to secure 5 footcandles at bottom of can held in horizontal position. 200 footcandles rectified fluorescent, general lighting, were

HOW TO CUT COSTS

IN LIGHTING MAINTENANCE

The "Watch Dog," newest in the G-E line of fluorescent lamp starters, does not have to be removed every time a dead lamp is replaced—it remains in the fixture, ready to start the new lamp. This reduces the time spent in lighting maintenance. Further, it permits immediate replacement of dead lamps because no "cooling" period is required.

What's more, the "Watch Dog" is a precision lamp starter and a dead lamp stopper that ends blinking and flickering. Precision starting adds greatly to lamp life because it uses a minimum of emission material so vital to long lamp life.

FOR ADDITIONAL DATA SEND THE COUPON

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Appliance and Merchandise Dept.
General Electric Company
Bridgeport, Conn.

Gentlemen: Please send me additional information about your new FS-40 "Watch Dog" Starter.

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Company .....

Address .....

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GENERAL ELECTRIC

installed, allowing instrument workers to make fine adjustments anywhere in the room. Daylight was excluded by walling up windows to prevent glare. Estimated increased working efficiency was 20 to 30 per cent. Approximately 80 to 100 workers are in this area. Cost per worker was approximately 15c per day for estimated average increase in efficiency of 25%.

Another interesting lighting bottleneck involving color quality of light was "broken" in the following manner:

Pits 12 ft. long, 4 ft. wide, and 8 ft. deep used for converting coke into carbon electrodes were lined with firebrick and surrounded by producer gas tunnels. The temperature in the gas tunnels was very high to convert coke to carbon. Any cracks in the walls of pits will allow flames to ignite coke in the pits, causing coke to burn rather than carbonize. Inspection is necessary each time pit is discharged. This is very difficult with incandescent lighting as cracks are very difficult to see in black walls, and minute inspection required going over entire area consumed several hours' time.

The entire area was lighted with high intensity mercury lamps with maintained intensity of 20 footcandles. Mercury light causes black walls to appear green, while cracks remain black. Even small cracks can easily be seen in the bottom of the pit while standing at floor level. Inspection time was reduced as much as 90 per cent.

Magnifying Local Light Aids Critical Work on Small Parts

By Howard L. Plahn
Houston Lighting & Power Co.

PRIOR TO the war, the F. H. Maloney & Co., of Houston, Texas, were using an incandescent lighting system which was augmented by roof skylights to light their one daytime shift. The company manufactures long-wearing fiber pump parts, piston rings, etc., as well as delicately machined metal parts for oil well equipment.

Then came the war! The plant went on a three-shift, around-the-clock work schedule that demanded more light for the night shift. This necessary lighting was furnished by simply installing a fluorescent industrial unit over each machine tool, mounted 8 feet high, with the larger lathes using the two 100-watt tube fixture and the smaller machines using the two 40-watt tube fixture.

This sounds like an almost too simple and unscientific approach to a lighting problem, but it was found that if the same area were lighted by the square foot method and without regard for machine location, only a few fixtures would have been saved, and would have resulted in some shadow with attendant low light levels on the working surfaces.

With a fixture above each individual machine, the operator has the most light where he needs it the most—on the work. In this case, the work had 50 footcandles of light with the spilled light illuminating the aisles, which proved very ample, because in most locations the machines were close enough to mount the fixture on 10-foot centers.

One difficult seeing task here was a lathe operation putting two tapers on a 64th inch steel pin. To aid the operator, a fluorescent local light was installed. It consists of two shielded 5-watt flu-

Howard Plahn measures lighting intensity over lathe upon which 64th-inch steel pins are tapered.

Heatless fluorescent lighting, and combination local lighting and magnifier feature this inspection room.

MEASURE *All* LIGHT SOURCES *Direct* . . . . . *without Correction factors!*

- √ FLUORESCENT
- √ INCANDESCENT
- √ SODIUM VAPOR
- √ NEON, ETC.

Whenever you see a lighting man taking a *direct* measurement from a flourescent or other special light source . . . conveniently and quickly, and without consulting correction tables . . . you can be reasonably sure the instrument is a WESTON Illumination Meter. For, all the WESTON models illustrated now are equipped to provide *direct measurement* of the illumination from *any* light source . . . regardless of the color composition.

The development of these versatile instruments stems from WESTON'S time honored policy of *pioneering* in the development of *new* measurement tools . . . then, *continuing* the research and development to constantly provide the utmost in convenience and dependability for the measurment need.

Complete information on WESTON instruments for convenient light measurement, as well as for efficient, automatic control of lighting, will gladly be sent on request. Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, New Jersey.

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DIRECT-READING ILLUMINATION METERS

Model 703 Sightmeter —equipped with the stable all-glass WESTON perfected VISCOR filter.

Model 603 WESTON Illumination Meter (VISCOR filtered)

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Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters...Aircraft Instruments... Electric Tachometers...Dial Thermometers.

orescent tubes with a five-inch magnifying glass mounted in the center. When this fixture is adjusted properly on its adjustable bracket, the operator views the small pin through the magnifying glass, which increases it to about the size of a building spike. The lense has sufficient focal depth to allow the operator some movement of the head without throwing the work out of focus. This fixture appears in use on the first lathe in the photograph.

The other photograph shows the air conditioned inspection room with 100 footcandles of light on the inspection bench. It will be noted that the magnifying local light is also used here for critical inspection of small parts. It was found that under incandescent lighting, the infra-red heat waves, even with the air conditioning on, would expand the metal parts and cause an inaccurate measurement. This was avoided by using fluorescent fixtures.

The painting in this plant is excellent. The ceilings and walls down to 6 feet above the floor are painted a flat white, which covers what was formerly bare concrete with a poor reflection factor. From 6 feet on down to the floor the wall is covered with a light blue paint. This prevents contraction of the eye pupil, because the wall in brightness is very near that of the work. If the walls were painted white, the eye would contract, and the darker machine work would be that much more difficult to see.

All light fixtures and lighting circuit conduits are painted red while all three-phase power conduits are painted black. Air and water pipes are in still another color for quick identification.

Daylight fluorescent lamps were found to give best color quality for this egg-breaking and inspection room. Importance of the light is indicated by the fact that each girl breaks and inspects 4,000 eggs per day.

Daylight Color Quality Best for Egg Inspection

By Floyd A. Covington
City Public Service Board
San Antonio, Texas

THE RECENT "Sight for Victory" industrial lighting installation in the Joe Lowe Corporation egg-drying plant, in San Antonio, Texas, is doing its important part in speeding "Food for Victory" to our men on the fighting fronts.

In addition, the installation probably sets a record for a maximum benefit given by a minimum number of lights and use of critical materials.

Only 18 two 40-watt fluorescent fixtures are providing 130 girls in the egg-breaking room of this plant with 32 footcandles of good quality illumination.

This is an average of only one light required for seven girls. The girls stand close together on both sides of three long tables and only six fixtures, 10 feet apart over each table, are required to give them the illumination they need. The daylight lamps in use were found to give best color quality.

Each girl breaks and separates approximately 4,000 eggs per day and must carefully inspect each egg broken. Therefore, simple as it is, this lighting installation is very important to this plant which is now operating 100% on Government orders.

Reflector Flood Lamps Applied Advantageously to Iron Works

By James T. Meador
Southern Electric Service Co.

DURING THE momentous time since Pearl Harbor, there have been many rapid advances made in all of the branches of industrial engineering. Especially so in the application of lighting for boosting our war production.

In this activity, while fluorescent lighting has come to the front in general use, the use of incandescent lighting has also progressed to a remarkable extent which is primarily due to its flexibility of application, allowing it to be used in so many places where any other type of illumination would be impractical.

This article has reference to the lighting of the main fabricating building of the Southern Engineering Company, at Little Pittsburgh, Charlotte, North Carolina, by means of the 300-watt, R-40, Reflector Flood Lamps mounted in adjustable bracket-supported sockets.

The building is 320 ft. in length, of sixteen 20 ft. bays; 60 ft. in width, and 40 ft. in height. Drop siding of corrugated iron was extended from the roof 15 ft. downward, leaving a 25 ft. height of open sides. Both ends were also open. The overhead traveling crane just cleared the underside of the trusses. There was no artificial lighting equipment as there had been no night work previously.

First of All

COME TAPE'S WAR JOBS

Maybe you don't hear much about tape as a valuable aid to the war effort. But it's like the PT Boats that flash in close to the enemy...zoom a torpedo to the target ...and are off again in record time.

Tape doesn't make the headlines often ...yet it's an integral part of the war effort. It's used in every branch of the war effort. It's used in every branch of the Armed Forces...in every industry that supplies the Armed Forces.

Naturally, these needs come first. Other orders are being filled as rapidly as possible.

UNITED STATES RUBBER COMPANY

1230 Sixth Avenue • Rockefeller Center • New York

Listen to the Philharmonic Symphony program over the CBS network, Sunday afternoon 3:00 to 4:30 E. W. T. Carl Van Doren and a guest star present an interlude of historical significance.

In consideration of the dense smoke within the building, from open forges, rivet heaters, salamanders, etc., such as are so extensively used here during the winter months, the use of the R-40 type lamp was recommended. The trial installation justified this recommendation as this type lamp eliminated the low value of the "maintenance factor" inasmuch as the reflector is sealed within the lamp and therefore does not lose its effectiveness as much as if it were open and subject to the usual dirt collection of open units.

These R-40 lamps were mounted at a level of 30 ft. from the ground, with a spacing of 10 ft. horizontally, on both sides of the building, with a multi-breaker switching center on one side controlling four of these units per circuit.

The lamps were all adjusted to a point where uniform, comfortable light covers the working area, and are so arranged that they can easily be replaced. Each replacement gives a light as bright as the original installation, which is in effect much the same as installing a whole new fixture.

Local Lighting Arrangements That Speed War Production

By E. L. Goddard
Houston Lighting & Power Co.

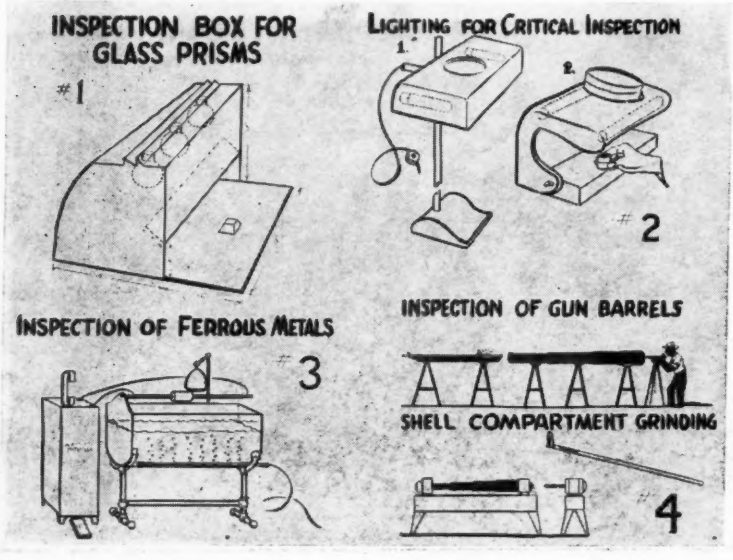
THE LIGHTING personnel of the Houston Lighting & Power Company have tried to make an all-out search for lighting bottlenecks in the large and small industrial plants in this area (numbering over 300) working on government contracts. Many local operations and special seeing problems have been uncovered, and satisfactory lighting applications have been made, a few of which are illustrated below.

Glass Prisms — One concern which grinds glass prisms was having trouble in getting suitable light for inspection of these units. They were using day-light through an open east window, and could only work a few hours in the morning when the sun was shining. The lighting box was designed and after trying various wattage lamps, they found the 75-frosted lamp used in the two outside sockets gave very satisfactory lighting and made possible the inspection of prisms on a 24-hour schedule if necessary. (See sketch No. 1.)

Precision Inspection—Precision inspection in another war plant is made through the use of a specialized lighting unit with a five power magnifying lens in the center of the inspection unit. Two 6-watt fluorescent lamps, mounted to the side of lens, provide 200 footcandles of light for critical inspection. The same type of inspection unit is shown, employing two 15-watt incandescent lamps and provides approximately equal footcandles of illumination for critical inspection. (See sketch No. 2.)

Fluorescent Magnetic Inspection —The fluorescent magnetic inspection method has saved many crackups in the field of aeronautics. The Precision Aircraft Rebuilding Corp., of Houston, employs this method for inspection of ferrous metal parts. A magnetic flux, or charge, is set up to magnetize the metal part. The polarized metal part is then washed in a mixture of naphtha, steel filings and fluorescent powder. The fluorescent coated particles of steel filings are drawn into any crack or discontinuities of the polarized metal and form a pronounced outline of the flaw when inspected under the near ultra-violet light. (See sketch No. 3.)

Gun Barrel Inspection — The inspection of gun barrels is made by mounting a round mirror on a long pole, tilted at a 45° angle and located just back of a 25-watt lamp, recessed in the inspection pole. The inspector stands 8 to 10 feet away from the opposite end of the gun barrel, and by adjusting the focus on sighting instrument, is able to inspect an area covered by 90° of the gun barrel's core circumference, on each trip made by the mirror reflector. Two men are employed and the reflecting mirror makes four trips through the barrel for completed coverage. (See sketch No. 4).



Proper Lighting Speeds Army Training Program

By A. E. Warner
Oklahoma Gas & Electric Co.

CONTRIBUTIONS of good lighting toward winning the war are not confined to the war industries, although it is in the industrial field that its values have won most general recognition. Another very important, though little publicized, phase has recently been receiving increasing attention from our military authorities. It has to do with speeding instruction and conserving the

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STANDARD KNOBS

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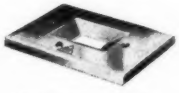
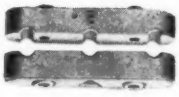


SWITCH BOXES AND COVERS

OUTLET BOXES AND COVERS



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★ Contractors everywhere know that Porcelain in large quantities is available — that, therefore, they can do wiring jobs today with no let down in wiring quality — that they still can assure customers of permanency, dependability, and economy — that simplified modern installations are the result of the use of All Porcelain Wiring Systems.

This all means continued business for you — wiring goes right along — porcelain products are in demand. So, as those calls come to you for porcelain, be sure you are prepared with ILLINOIS PORCELAIN.

No vital materials go into the production of porcelain, materials do go into porcelain that make these systems durable— that are not affected by rust or corrosion — that make possible full safety — that make these systems valuable where there is dampness and fire hazard.

Illinois all porcelain wiring systems are adaptable to practically all wiring plans and layouts. They can be installed without grounding.

Illinois ELECTRIC PORCELAIN CO.

MACOMB, ILLINOIS

eyesight of our men in special training. This activity appears, at present, to be mainly confined to military aviation training, but there is every reason to encourage expansion of interest in properly applied lighting wherever training is being done for other branches of our military and naval forces.

In one section, attention was first focused on student-lighting as a result of relatively high percentage of failures in eyesight tests among graduating trainees, who had passed the same tests with acceptable margins when starting the intensive training course twelve weeks earlier. Need for investigation was urgent, since each failure represented a loss of both manpower and the time and expense of training.

Quickly realizing that the trouble must be due to defective lighting conditions, the commanding officer requested that lighting engineers of the electric service company make a survey and report with recommendations for needed improvements on the lighting of class rooms and barrack rooms, the latter being now much used for study.

To the lighting men, the many detrimental features were obvious. Most of the errors were undoubtedly due to the rush planning for erection in minimum time of our many aviation training centers. In some instances, special uses of rooms could not be anticipated. In others, basic lighting principles were apparently ignored. Dark ceilings, too low fixtures, overlamped and under-lamped units, improper units and excessive spacings, these and more were found and reported in the survey.

As a result of this work, correction of the more readily remediable features was promptly made, and plans made for additional changes as conditions permit. It is anticipated that future completions of similar projects will show that more attention has been given to lighting.

Realization of results of adverse lighting conditions, and their effects on trainees has brought about another and related activity which will prove far-reaching in its influence, since it will also beneficially affect civilian students after the war.

Within the past very few weeks, the U. S. Army Air Forces have still farther expanded their training facilities, and for that purpose have leased a number of colleges in various parts of the country. In these also, short time intensive courses will be conducted. For quickest, most efficient results and minimized failures, lighting is receiving immediate attention.

Classrooms of some of these colleges, as is true of most such institutions throughout the country, are not of recent construction, have received little remodelling and hence are inadequately lighted. Even among those with newer buildings, there is too large a proportion where lighting was incompetently planned. In too many instances dormitory rooms have evidently received no consideration as being possible places for study. Efforts to induce improvement have too often met with indifferent regard and minimum action from college officials.

Army control is effecting changes in its leased colleges in one region, and probably in others. By special bulletin to the officials of colleges under jurisdiction of the Gulf Coast Training Centers, the commanding general has requested complete lighting surveys and reports on all classrooms, laboratories, study halls and at dormitory study tables. The survey covers present lighting intensities, fixtures, effective voltages, and wire sizes of branch circuits and feeders. Required recommendations include equipment and wiring changes needed to provide established standards of illumination in the areas considered. Estimates are prepared by Army District Engineer and are forwarded to headquarters.

Confidence in the ability and helpful spirit of electric service company engineers is shown by the inclusion in the bulletin of "In order to accomplish this survey, it is suggested that the assistance of the local utility company be requested."

Sufficient time has not elapsed since the submission of this company's survey reports on two of the colleges, to permit letting of contracts, but it seems certain that desirable lighting improvements will be made at an early date. In addition to the immediate results, advantageous factors created are the interest in lighting awakened in the civilian authorities of the particular colleges affected, and the precedents and criteria created which will prove helpful later in working with civilian schools.

We feel that our participation in this work has been well worth while, and that similar efforts will merit the attention of other lighting men who are building now for future wider lighting betterments.

Open Bus Feeder Installed Length of Industrial Plant

By R. Warffuel
Wheeling Electric Co

THIS REPORT relates to a plant engaged in the manufacture of trench spades, picks, and sledge hammers for the armed forces. The Ordnance Departments of the Army and Navy had requested this company to double production. They were unable to employ three full shifts, because of the extremely poor lighting conditions. Engineering service was requested, priorities were figured, and the new installation was completed on July 2, 1943.

Because of the extreme heat and smoky conditions coming from the twenty forges located in the main plant, the lighting problem presented was one of maintenance, rather than plenty of footcandles.

The size of the main plant is 260′ x 70′. Fifty-six outlets were spaced on 14′ x 17′ centers, with a mounting height of 18′. Deep-bowl, industrial-type units, equipped with lenses and 750-watt lamps were used. This provided an overall intensity of 30 footcandles.

A complete rewiring job of this plant was necessary, and this was accomplished by runing an overhead open bus from main line switch throughout the length of the plant, with conduit runs to panel boards.

It was also necessary to rewire the machine shop, lacquer rooms,

These before and after pictures show the tremendous improvement in lighting in this war plant.

and inspection department. Here fluorescent lighting was installed with continuous rows of twin 100 watt lamp fixtures on 10′ x 20′ centers. Supplementary lighting on each machine tool was also installed. The general illumination was 40 footcandles, and the supplementary provided 100 footcandles on the work plane.

Swinging Fixture Mounting Designed for Large Lathe

By Herman Trauernicht and Wesley A. Kuenemann
Houston Lighting & Power Co.

RECENTLY R. E. Crane, district manager for the American Iron and Machine Company, made an inspection trip through the Houston plant and immediately recognized that the operator on one of the big 48-inch lathes needed more light. He knew he could get his problem solved by calling the Houston Lighting & Power Company Commercial Department. It was easy enough for the lighting engineer to tell Mr. Craine where he needed the light and how much he needed, but the big problem was how to install the lighting fixtures so that they would not interfere with the loading and unloading operations, but Mr. Hurley, the superintendent of American Iron and Machine Company, and Mr. Trauernicht, the lighting engineer, collaborated, and in an ingenious fashion, put the light where it was needed and in the proper intensity.

The particular operation on this lathe is the machining and threading of 14-inch propellor shafts, varying in length from 12 feet to 20 feet. These huge shafts are vitally needed in the vast shipbuilding program which is going on in the immediate vicinity of Houston. Each shaft section weighs from 4 to 5 tons and must necessarily be put in and taken out of the machine by an overhead crane. Any lighting fixture installed must leave room for the crane's fall lines and not interfere in any way in the ticklish job of centering the rough forging on the lathe centers.

It was impossible to provide

Getting enough light on a lathe used for 20-ft. propeller shafts without blocking overhead crane was the problem solved in this Houston plant of the American Iron and Machine Co. The fluorescent fixtures are mounted on a pipe structure that can be swung out of the way when shafts are being moved. R. E. Craine, district manager of the company looks on while lighting expert Herman Trauernicht points out improvement.

lighting from a source somewhere above the crane ways as the number of fixtures required to give adequate intensity from a 30 foot mounting height were not immediately available, and would have entailed the use of a great deal of critical material. Mr. Trauernicht suggested that the light be supported and mounted approximately eight feet above the floor, and indicated that four two-lamp, 100-watt fluorescent fixtures would be adequate for this critical job. Mr. Hurley then designed the rather ingenious means of support for these units. He built a cantilever type truss from which to support the fixtures. This truss was built out of scrap 1-inch pipe that was lying in the maintenance stock pile of the shop. The truss in turn was supported by means of two triangular hinges, swung from the columns of the shop.

This arrangement permits swinging the lighting fixtures against the columns and out of the way during the loading operation, for which the overhead lighting is sufficient. When the operator is ready for the machining of the shaft, he positions the lights over the machine and he has an adequate amount of light to do the job accurately, quickly, with the greatest of seeing comfort. Where formerly the operator worked under an intensity of 5 to 8 footcandles, he now has a lighting intensity of 80 to 90 footcandles on his work. Thus, through a proper lighting job the possibility of work spoilage is reduced to a minimum, and through the ingenuity of the superintendent and the lighting engineer, a great deal of critical material was saved.

Lighting Intensity Increased Ten Times in Cabinet Shop

By Floyd A. Covington
City Public Service Board
San Antonio, Texas

THE STEVES Sash and Door Company, in San Antonio, Texas, was one of the first planing mills in this part of the country to employ women to do cabinet work.

When we called on them, we found a group of women nailing, glueing and finishing cabinets, desks, shelves, drawers and lockers on order by the Government. Some of these were to go on ships, others to the Army. This work was being done in a building 57′ x 75′ with no artificial lighting except two bare, 300-watt lamps on drop cords at the farther end where there were no windows. The only other light the carpenterettes had was the daylight that came in through the windows on two sides.

In the center, where, no doubt, the thumb had all too often been hit instead of the nail, there was a horizontal intensity of about 2 footcandles. The intensity improved, of course, as one approached the windows, but at the same time the direct glare from the unshaded windows also increased.

To add only one light per 20-foot bay would have been a great improvement over what they had, but a plan was submitted that conformed to a standard layout and it was hoped the manager could be made to see the practicability of a good installation. His first reaction was that too many lights had been recommended, but to our agreeable surprise he eventually accepted the 9′6″x10′ spacing and ordered the lighting installed exactly as recommended.

Thirty-two two 40-watt fluorescent industrial fixtures were installed at a height of 8′8″ above the floor, and 20 footcandles of illumination is being obtained from the daylight lamps in use. The manager is well pleased with the results of the installation, and has called on us to plan an installation of infra-red drying lamps to further speed up their important war production job.

Three Shift Operation Requires Better Lighting

By Wm. M. Langstaff
Appalachian Electric Power Co.

THIS Huntington, West Virginia, machine shop, which is doing about 85% war production work in making repair parts of various sizes and no two jobs alike, caters mostly to larger war production plants in the Tri-State Area, and has an enviable reputation for getting work done accurately and on schedule.

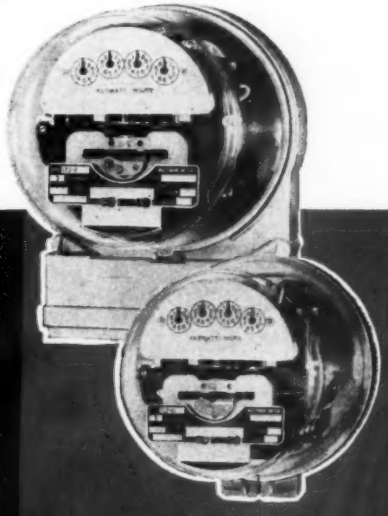
Before the war, the Thos. O'Neill Machine Shop operated with a small crew of men who worked mostly during daylight hours. The building housing this machine shop is sandwiched in between other buildings, so that the only natural daylight available is from a few skylights. Evidence of lack of artificial lighting is indicated in the "Before" picture — local lights on machines with scattered general lighting. Added to this were very dark walls and ceiling as well as dark or black machinery.

As orders started piling up and it became necessary to change

WAR BONDS MAKE UNCLE SAM MORE POWER-*full*

"On Measurement is founded the whole progress of man.."

In counting, the Romans used units of five based on the fingers of the hand. They would mark I "one", II "two", III "three", IIII "four", and to show a "tally", the fifth mark was diagonal, forming a V. So V meant five; X meant double V, or ten. Counting sheep was the test of accuracy. If the counter bent his head to mark a "tally", many quick little sheep could dart past; if he attempted to memorize the "tallies", he became so drowsy that whole units were often forgotten. Yet, that was the conception of accurate measurement. Compare it with today's high standard of measurement of electricity set and met by the electric utilities and the manufacturers of watthour meters.



NO OTHER COMMODITY IS MEASURED SO *Accurately* AS ELECTRIC POWER

● SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS ●

Before and after installation of 500-watt RLM Dome reflectors

over to twenty-four hour operation, the need of lighting improvement soon became one of the essential considerations for this operation. In fact, a master mechanic, being offered a promotion to foreman of one of the night crews, would not accept this promotion until assured by the management that lighting improvements would be made immediately, as several of the night men had already complained about the poor lighting.

Complete lighting and wiring recommendations were then submitted by the Appalachian Electric Power Company, including suggestions as to painting the interior and machines. Mr. Stettler, general manager, was completely sold on a thorough renovation, and assistance was given in presenting the request to the WPB for preference rating. Adequate rating was soon forthcoming and Mr. Stettler placed a blanket order on a local jobber for material.

Plenty of obstacles had to be overcome due to overhead powering with the necessary line shafts, belting, etc., which will gradually be changed to individual powering. The "After" picture indicates the extent of improvement. Painting the walls and existing ceiling white together with the installation of 500-watt lamps in RLM Dome reflectors with symmetrical spacing resulted in an average level of 35 footcandles of comfortable lighting as compared with the previous three or four footcandles. Some of the machines are painted medium gray with a program to repaint all machines.

The sixty employees are most enthusiastic, and particularly those on the night shifts. Tangible results are rather hard to analyze with this type of work, but a statement made by Mr. Stettler, "Six times normal volume of business with about four and one-half times the number of employees," sounds convincing.

75 Footcandles Usable Lights Provided for Sewing Rooms

By W. P. McCutcheon
Birmingham Electric Co.

IT IS NOT NEW to the lighting industry or officials of the War Production Board that production of needed materials largely depends on the ability of individual workmen to see clearly how to perform their jobs both day and night. It is also known that fine detail work requires more light to produce the same ease in seeing than less severe tasks. Sewing is one of the operations which requires a rather high level of light at the working point to insure good workmanship and speed.

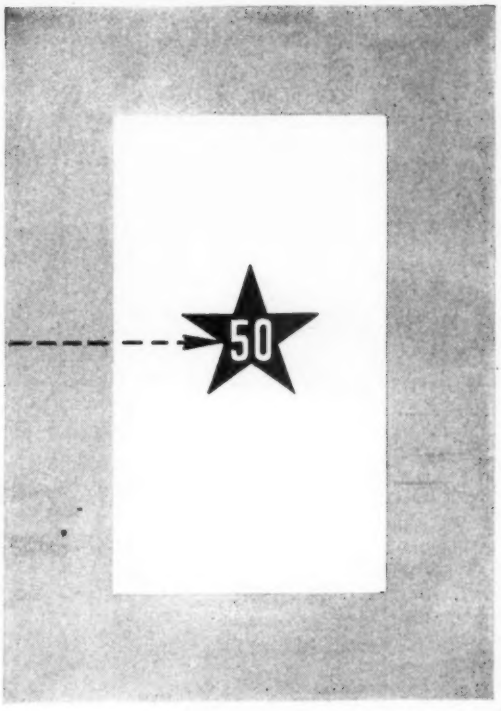
Such a problem is found in The Harless Company plant engaged in ordnance work. Three shifts each day are required to meet the production schedule. The skill of each operator alone was not sufficient, as seeing plays a most important part in this operation. The level of light necessary at the working point exceeded economical and practical limits of general lighting, which made it advisable to use a combination local and general system.

Industrial fluorescent fixtures using two 40-watt lamps per unit were selected for the general

(Continued on page 80)

These sewing machine operators work under 25 footcandles of general illumination supplemented by 50 footcandles from well shielded local units.

an open letter to WIREMOLD men in the service...



Hartford, Connecticut

I cannot tell you how much personal satisfaction it gives me to report to you that your Company has been awarded the Army-Navy E for excellence in the production of the materials you need to fight with.

The men and women you worked with have earned this award by putting every ounce of their energy, and then some, into their particular jobs. Our part is a small one compared to the one all of you are playing, but in this man's war, every wheel must turn constantly and fast.

We can honestly say that one of the most important factors in spurring us on to the kind of effort we have achieved is our thoughts of those of you who have left to go into the armed forces. The work that has brought this Award is about the only way we have of telling you that we're in the outfield backing you up. You have our pledge that we will continue to do so.

Best of luck from all of us.

THE WIREMOLD COMPANY

L. Hayes Murphy
President

P.S. We are continually increasing our purchase of War Bonds, too.

WIREMOLD Makers of Textile Webbing and Metal Precision Parts for the Army and Navy.

Hotpoint's Bond Wagon D
Another Hot Campaign

Start the 3rd WAR LOAN righ
Get on the Bond Wagon now

The tempo of the war steps up on world battlefron
The obligations of those of us on the home front i
crease. Hotpoint's War Bond Campaign for fall follow
the pattern which has won so much acclaim from go
ernment officials and building industry alike. This fa
program cooperates with the Government in reachin
its *3rd War Loan* objective—inducing larger numbe
of wage earners to buy more and *still more* War Bond

● Thomas H. Lane, Chief, Advertising Section, Treasury Department, Washington, says: "We will certainly appreciate anything you can do in connection with the *3rd War Loan* and I hope you will send me proofs of your fall advertising when they are ready. Many thanks again for the grand job you and your company are doing on behalf of the Treasury."

Here's how you can help. You can support Hotpoint's Bond Wagon Campaign with your newspaper advertisi
and in your sales contacts. Newspaper mats are availab

Hotpoint has a complete Bond Wagon Plan for t
building industry. Now is the time to get in contact w
builders in your territory to pre-sell electric homes
the postwar era. Your Hotpoint distributor has this Pl

Edison General Electric Appliance Company, Inc.
5614 West Taylor Street, Chicago 44, Illinois

Wartime Canning Book a Big Favorite

Hotpoint's Wartime Home Canning Book has been acclaimed an important contribution to Victory Gardeners. Thousands have been bought by utility companies and retailers for distribution to their customers. With the fall canning season approaching its height now is the time to place your order with your Hotpoint distributor.

ELECTRIC Hotpoint KITCHEN

REFRIGERATORS • RANGES • WATER HEATERS • WASHERS AND IRONERS • CLOTHES DRYERS • AUTOMATIC DISHWASHERS • ELECTRONIC • STEEL

Drive Rolls Into

We're Paving the ROAD TO VICTORY!

BY getting all the War Bonds we can possibly afford we're helping to bring the great day of peace nearer. The War Bonds which pave the Victory road today will lead to a truly modern home tomorrow. Our War Bond savings will provide the means for a new Hotpoint Electric Kitchen when the war ends.

Our War Bond Savings Will Buy a Hotpoint Electric Kitchen

FOR HOMES COSTING $6,000.
The Meadow Lark Kitchen illustrated is designed for homes costing as little as $6,000 and is completely electric, with Hotpoint Range, Refrigerator, Dishwasher, Sink and Hotpoint Steel Cabinets.

FOR HOMES COSTING AS LITTLE AS $4,000

Hotpoint Electric Kitchens including Range, Refrigerator, Sink and Steel Cabinets have been installed in numerous homes costing only $4,000.

THE FIRST STEP IN HOME MODERNIZATION

YOU can change or beautify your home any way you wish—but it won't be a real postwar job of remodeling until you've installed a modern electric kitchen. That's why so many families are earmarking their War Bond Savings for a new Hotpoint Electric Kitchen. Profiting by the discoveries and improvements of wartime production, our engineers will be able to build even thriftier, more efficient equipment after Victory. Start your modernization program today by sending the coupon below.

BUY WAR BONDS TODAY—an Electric Kitchen Tomorrow!

HOME PLANNING FILE

Start your plans ...

'll be able to save time and by buying perishable foods antities. And foods stay longer in the Hotpoint Refrigerator.

• Two of your most tedious tasks will be gone with a Hotpoint Automatic Electric Dishwasher to do your dishes —a Hotpoint Disposall to get rid of food waste before it becomes garbage.

Kitchen Averages About 10% of Home-Building Costs

point ELECTRIC KITCHENS

HOTPOINT'S NATIONAL ADVERTISING FOR FALL AND WINTER, 1943

PUBLICATION	ISSUE
Bride's	August 15
Successful Farming	September
House Beautiful	September
House Beautiful Maintenance and Building Manual	September
Better Homes and Gardens	September
Collier's	September 4
Electricity on the Farm	September
American Home	October
McCall's	October
Electricity on the Farm	October
Saturday Evening Post	October 9
Successful Farming	November
House Beautiful	November
House Beautiful's Guide for the Bride	November
Electricity on the Farm	November
Better Homes and Gardens	December
American Home	December
Collier's	December 11
McCall's	December
Saturday Evening Post	December 11

TOTAL ADVERTISING MESSAGES 33,216,000

Above is the first in Hotpoint's fall series of full-color advertisements in National Magazines.

SCRAP IS POWER

Cooperate with your industry! Salvage all inoperative parts containing critical material. Put vitally-needed scrap back into the scrap TODAY!

NEWS of the INDUSTRY
National and Southern

Fluorescent Fixtures Under New Controls

Further control over the manufacture and distribution of fluorescent lighting fixtures, with particular reference to the weight of metal permitted, is established by General Limitation Order L-78 as amended August 18 by the War Production Board.

After December 1, 1943, fixtures for office and drafting room use, termed "non-industrial," may be manufactured subject to specified weight limitations on the use of metals. At present the manufacture of these fixtures is prohibited except by special authorization. The demand for them has been met by drawing on stock produced before June 1, 1942, and the change has been made because inventories will be practically exhausted by December 1, 1943.

The manufacture of certain types of industrial fixtures, formerly permitted, is now prohibited and weight limitations on metals are extended to include all permitted industrial types.

The amended order also makes the following changes:

Stops the sale of fixtures between manufacturers and distributors except on rated orders.

Eliminates the provision of the earlier order whereby retailers may make application for authority to sell inventory without ratings. Depletion of retail inventories has made the provision unnecessary.

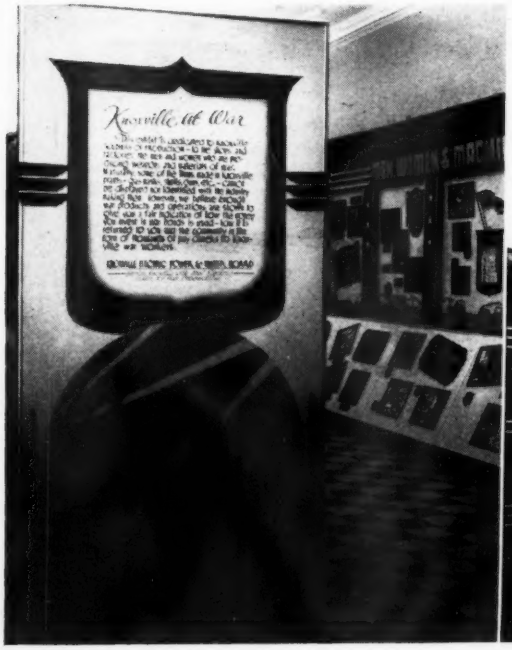
Further controls the delivery of fixtures or component parts by prohibiting delivery for "storage"; deliveries may still be made for demonstration and test purposes, however.

Excludes the following three types of fixtures from metal weight limitations and from restrictions on the use of metal in reflectors: industrial portable types hazardous location fixtures of vapor tight or explosion proof type, and fixtures for use on board ship. The metal limitations and restrictions are impractical for these types of fluorescent lighting fixtures.

Effective dates for the amended order are: additional restrictions on the use of metals: date of issue; manufacture of non-industrial types: December 1; prohibition on manufacture of certain industrial types: September 8; stoppage of sales on unrated orders between manufacturers and distributors: September 1.

Labelling Suspended on Type RW Insulated Wire

Type RW (N. E. Code) insulation for building wire has become a wartime casualty. This type of insulation is recognized in the 1940 edition of the National Electrical Code. The table with Section 3005 describes it as "moisture resistant" and suitable for general use or in



ELECTRICITY'S PART IN THE WAR—To show the people of Knoxville the important part electric power is playing in war production in and near Knoxville, the Knoxville Power and Water Board has arranged a photographic exhibit occupying the entire floor of their downtown building. J. L. Parrott, of the Power Board, with War Department permission, made more than 200 action pictures in Knoxville's war industries which he enlarged and mounted for the display. At left is panel at entrance explaining purposes of the exhibit. Below, a window display directing attention to the photographic display in the lobby of the Power Building.

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE

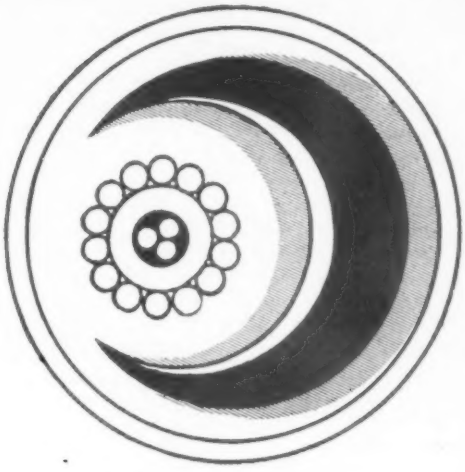
CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

The Mark That Stands For

QUALITY

in

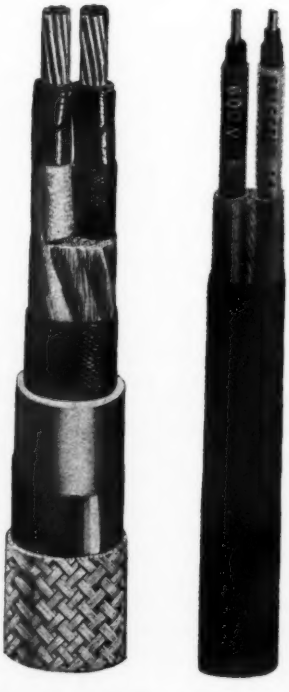
Electrical Wire and Cables



At home or abroad, the emblem that identifies

CRESCENT
WIRE AND CABLE

stands for more than half a century of experience, as well as painstaking care in production.



CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

SOUTHERN REPRESENTATIVES

ATLANTA, GA.
Edgar E. Dawes
A-4 Rhodes Bldg. Annex

NEW ORLEANS, LA.
Paul Hogan, Jr.
823 Perdido St.

DALLAS, TEXAS
M. C. Huie
707 Thomas Bldg.

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE

wet locations where lead-covered conductors are otherwise required.

To demonstrate the moisture-resistant properties of the special rubber compounds employed as insulation on Type RW wires, Underwriters' Laboratories, Inc. applies two special tests for water absorption and for specific inductive capacity. Or, a satisfactory long-time service record is accepted for either one but not both tests.

The insulating compounds for all listed makes of Type RW wire have contained large proportions of new natural rubber, the use of which will not be allowed beginning September 1 in view of steps being taken by the War Production Board to conserve the diminishing stocks of natural rubber for critical war material.

Investigation of the properties and performances of compounds made with available rubber substitutes have been scheduled with active industry co-operation. Unfortunately, no short-cuts in this research have as yet been devised. Therefore production, with the Laboratories' label, of wires tagged "Type RW" is to be suspended at the end of the month of August.

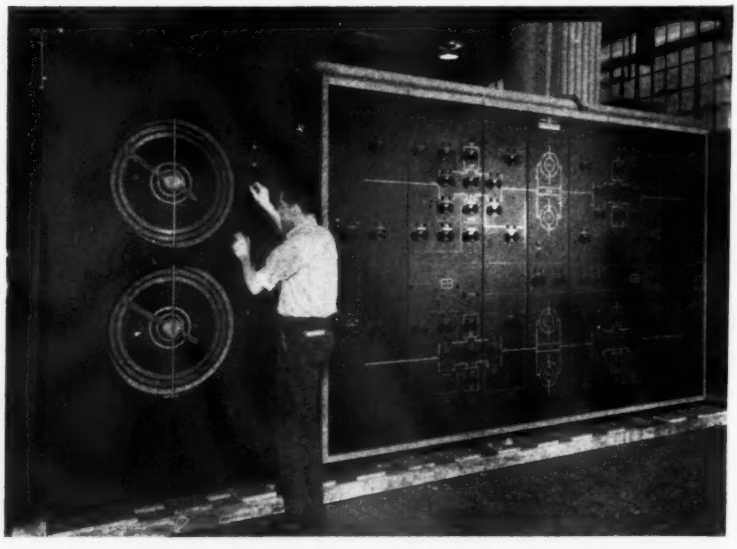
From the N. E. Code viewpoint, recognition of Type RW insulation results in omission of lead sheaths formerly required where wires are installed (Section 3035): "a. Underground; b. In concrete slabs or other masonry in direct contact with earth; c. In wet locations; d. Where the condensation and accumulation of moisture within the raceway is likely to occur."

Lead is not a critical material and return to the use of lead-covered cables where wires must be employed under the above conditions seems to be called for until acceptable properties and performances of new insulating compounds not employing new natural rubber have been established.

Purchase of 15th Plant Announced by Sylvania

Sylvania Electric Products Inc. announced recently the acquisition of its fifteenth manufacturing plant, a steel and brick structure in Warren, Pennsylvania, which after conversion will be devoted to the production of assembly parts for radio tube, lighting and electronic products.

The structure, a former motor sales and service building with a floor area of 17,600 square feet, will be converted immediately, with the start of production scheduled for early September.



ROBOT CONTROL FOR PROCESSING PLANTS—The control shown here opens and closes dozens of valves with split-second timing. It is used in many of the nation's processing plants producing aviation gasoline, butadiene for synthetic rubber, and toluene for explosives. The operator's section of the "robot" consists of a long control panel somewhat resembling the main switchboard in a telephone exchange. Covered with banks of switches, dials, lights, and other indicators, it is the focal point for valve control. When a valve is opened or closed, a light on the board goes on. If any valve should fail to open or close, the board would automatically suspend further operations and sound the alarm for an operator. A glance at the board would give the operator the trouble location and he could arrange for quick repairs.—*(GE photo)*

NEMA Announces Wartime Information Program

The Electric Range Section of the National Electrical Manufacturers' Association announced recently through its Chairman, H. M. Parsons, plans for a new cooperative informational program, Covering the use of electric cooking equipment.

This new promotional project will have two major parts; a wartime educational service for home economists, teachers and students, written around electric cooking, and a series of advertising messages to be carried in leading architectural magazines designed to acquaint builders with the need for providing adequate electrical facilities in all new houses.

The series of educational releases for home economists, teachers and students, which will be run in "What's New in Home Economics" and in "Practical Home Economics", will carry information useful in keeping existing electrical equipment at peak operating efficiency as well as suggestions for obtaining full use from these facilities. It will also include a series of lesson texts for classrooms and other instructions covering such timely subjects as home canning, proper use of surface cookery, preservation of the nutritional values in wartime foods, economical oven baking, and general care and use of equipment. In addition to its wartime conservation theme, the series will also be designed to prepare students for better and more extensive use of electrical equipment which will be available after the war.

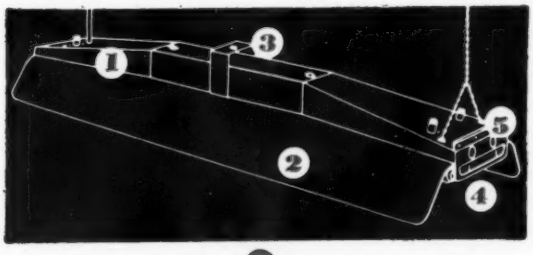
The educational advertising program for builders, on the other hand, will be prepared around the theme that all houses planned for postwar construction should have adequate provision for extensive electric kitchen facilities. According to Mr. Parsons, the rapid increase in the use of electric cooking and water heating, temporarily interrupted by the war, will be resumed at a greatly accelerated rate just as soon as the manufacture of electric ranges and water heaters is permitted.

The Latest and Best IN FLUORESCENT LIGHTING!

EFFICIENT! SIMPLE! PRACTICAL! ATTRACTIVE! EASY-TO-CLEAN!

1. Ingeniously engineered Accessory Housing—long—lean—good looking—and tough! Meets W. P. B. metal limitations. Die-formed from a single piece of steel.

2. Masonite "REFLECTOR-BOARD" Reflectors; formed in our plant, rigidly checked, quality controlled. Finished "300° White" (88% R. F.). Reflector easily removed and reinstalled, with "Flexible Triggers."



3. Hang it anywhere—anyway! K.O.'s for conduit and chain. Sliding hanger for outlet spacing variations.

4. Supports for Eggcrate Louvres, when desired. Louvres can be attached to standard units, initially or at later date.

5. "Bump-Proof" end-plates give added lampholder protection. Starters easily accessible even when SUPER-ILLUMINATORS are mounted directly at ceiling.

For full details on the GUTH Super-Illuminator, Write for Catalog Sheet No. 744.

★ ★ ★ ★ ★ ★ ★ ★

Leaders in Lighting Since 1902 **Guth**

★ ★ ★ ★ ★ ★ ★ ★

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

Southeastern Engineers Will Meet in Birmingham

Arrangements have just been completed for the Fall Conference of the Engineering and Operation Section, of the Southeastern Electric Exchange, to be held at the Tutwiler Hotel, Birmingham, Alabama, on Thursday and Friday, September 23rd and 24th, according to an announcement by J. W. Talley, executive secretary.

An interesting program is being planned by Chairman P. J. Carlin to cope with the problems now confronting the industry and particularly those problems which are a direct result of war conditions and restrictions, which will be announced in due course. It has been suggested that at least a part of the conference be devoted to discussion of postwar problems and those that will face the operating utilities during the transition from war to peace times.

Wartime Program Planned

Some of the subjects scheduled for presentation in the form of papers or prepared discussions by authoritative speakers are:

Operating practices under wartime conditions and restrictions.

Shunt and series capacitor installations—application and operating experiences.

Determination of fault currents on distribution lines for both delta and grounded wye, including transformers.

Discussion of measures to prevent service interruptions due to lightning.

Discussion of manpower utilization—(a) replacement schedules and deferments (b) extended work week (c) employment of women.

Determining capacity of grounding banks.

Influence of new materials on future designs.

Application and experience of heat exchangers on power transformers.

Listings and exchange of excess materials.

Postwar planning for electric utilities—(a) plans for personnel readjustments (b) planned maintenance (c) methods of utilizing existing facilities to serve new sources of load with minimum system investment—load growth possibilities (d) long range plans for system improvement.

Discussion — characteristics of various types of motors and their influence on utility facilities.

Those planning to attend are urged to make their travel reservations both ways early. Hotel reservations should be made well in advance of the meeting, preferably by September 10th, advising time of expected arrival and departure.

THE POSTWAR WASHER—This is what the first washers off Universal assembly lines in postwar days will look like says Jeff Donnell, Columbia starlet . . . pre-war models for postwar days will be featured when Universal plants begin to convert to peacetime manufacturing. The ultra-ultra designs will follow later.

OWU Simplifies Utility Service Extensions

The Office of War Utilities has eliminated a vast amount of paper work by simplifying the system by which applications for extensions of utility services involving small amounts of materials are handled.

A new order, U-1-f, permits utilities to grant extensions without filing applications with Washington when the restrictions of the order are met. This implies no relaxation of the restrictions, but eliminates processing of eight to ten thousand applications a month, most of which have been granted as a matter of necessity.

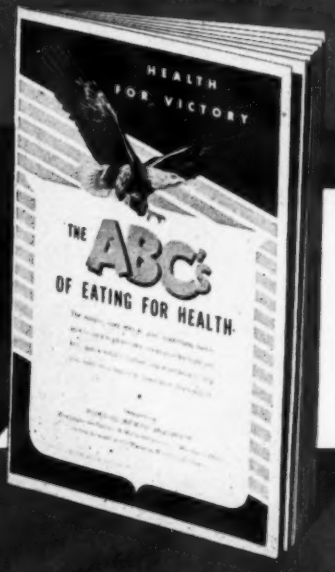
Under the new rules, domestic consumers seeking extension of electric, gas or central heating service must be located in a critical housing area as determined by the National Housing Administration. This list is attached to the order as Schedule A. Water consumers need not be in one of these areas, as long as other restrictions of the service extension order are met.

Industrial and commercial consumers must be engaged in an essential activity as defined in Schedules I and II of CMP Regulation 5. The cost of the extension must not exceed $1,500 for underground construction or $500 for other construction.

Schedule B of the order sets up

YOU CAN BUILD GOOD WILL NOW FOR LATER with these Four Wartime Booklets

Now in its third million, this 52-page revised wartime edition will reduce needless service calls by educating users on proper care, maintenance and the more simple repairs. Your cost for this book only $1.00 per 100.



This book tells what the right foods are and why they are important; how to plan health-building meals; practical facts about vitamins and minerals in foods. Your cost for this book only $1.50 per 100.

Contains recipes and ideas for putting variety, health and energy values and taste appeal in lunches under wartime food restrictions. All recipes have been tested. Your cost only $2.00 per 100.

Timely book has special appeal to thousands of patriotic Americans growing their own food. Tells how to save money and ration points by canning food. Your cost for this book only $4.50 per 100.

SAMPLE COPIES OR QUANTITIES AT ABOVE PRICES AVAILABLE FROM YOUR WESTINGHOUSE APPLIANCE DISTRIBUTOR

Westinghouse Electric Home Appliances

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

complete construction standards for each type of extension, setting forth the specifications of permitted materials.

The new order does not apply in any case where construction or renovation is involved costing more than $200. In these cases, permission for construction must be obtained under Order L-41 and the utility construction is governed by Order U-1-d. U-1-f covers utility extension where construction or renovation cost is under $200, or where none is involved.

Mississippi Launches Customer Service Plan

New customer service plan launched on July 12th by Mississippi Power Company to meet home electric problems. Recognizing the need for a program that would make possible calls in every customer's home, plans were formulated that not only make such calls possible but make the calls desirable and helpful both for the company and the customer. The aims of the program are not new — they are:

1. To help each electric customer make the most satisfactory and economical use of his electric service and equipment.

2. To keep him satisfied with the company's service by discovering and removing any causes for dissatisfaction.

SAILORS LEARN TO COOK—"Slum Gullion?" "Chow?" Certainly NOT! Mealtime aboard one of Uncle Sam's ships is an event that millions of sailors actually DO write home about. For the Navy trains its cooks as carefully as it trains its gunners. Cook's schooling includes special instruction in the operation of the electric galley equipment found on all the newer vessels. Classes like the above, held at the Edison-Hotpoint plant in Chicago, cover all phases of cooking, baking, broiling and frying. Here, Russ Bloomberg, expert in large-scale cooking operations, explains the technique of "french frying" with the automatic electric fry kettle.

3. To win and maintain good will for the company and further contribute to the war effort.

In making plans it was felt that some special attention, service and assistance should be included that would benefit each customer contacted. With these thoughts in view it was decided that each customer would be given free a thirty-three page booklet containing information on the proper care and use of electric appliances. Many household "tips" to make housekeeping easier and appliances last longer during war time are included in the booklet, as well as recipes for unusual dishes and hundreds of other useful "hints" for the homemaker.

Among others, some of the things the company will do on these calls are:

1. Check all appliances.
2. Suggest correct way of appliance use and care.
3. Make minor repairs on cords, etc.
4. Bring in small appliances for shop repairs.
5. Take orders for major appliance repairs.
6. Teach replacement of blown fuses.
7. Follow through on sale and trade of customers' idle appliances.
8. Help salvage materials.

The first weeks report are most encouraging and offer convincing evidence that the program is very much worth while. 71% of the customers contacted were given care and use instructions on electric appliances; 88% were given instructions on fuse replacement; 13% wished to buy some electrical appliance; and 31% received service on appliance cords or appliances at the time of the call.

WAKEFIELD GETS ARMY-NAVY "E"—A. F. Wakefield, president of the F. W. Wakefield Brass Co., is shown here accepting the Army-Navy "E" Production Award during the special ceremony at Vermilion, Ohio, headquarters of the company. For nearly three years the company has been heavily engaged in producing equipment for industries, barracks and marine use.

SILVER MIRROR GLASS

Less Metal But More Light

One way to save metal is to specify "X-Ray" Reflectors. Even the largest wattage "X-Ray" Industrial Lighting Units contain only a few pounds of metal in the socket and supporting parts. The "X-Ray" reflector itself is made of a less critical material, glass—Silver Mirrored Glass which has the highest reflecting efficiency of any reflecting surface used commercially.

Efficient practical units are available for high and low bay lighting for 100- to 1500-watt incandescent lamps and for the 400-watt Mercury lamps.

Long life, simplicity of installation, a remarkably low maintenance cost and moderate first cost all recommend these units.

For complete information send direct to us for the new Curtis Industrial Lighting Booklet, or to the Curtis representative near you.

CURTIS LIGHTING, INC.

6135 W. 65TH STREET · CHICAGO

U. S. Rubber to Increase Asbestos Fabric Output

United States Rubber Company will increase by 50 per cent its capacity for the production of asbestos fabrics used principally in war products, it has been announced by Herbert E. Smith, president. Mr. Smith said the company would increase its production 50 per cent by expanding the asbestos facilities of the Stark Mills, operated by the company's textile division in Hogansville, Ga.

The material is used in the manufacture of fire-fighting suits for the Army and Navy Air Forces, air ducts for both the heating and deicing of bombers and fighter planes, insulating tape for naval cable and electrical apparatus, and other products vital to the war effort.

"Our company has developed a new method of spinning asbestos fibers into fine yarns," Mr. Smith said. "Fabrics made from these yarns, known as Asbeston, are extremely lightweight. For example, fire-fighting suits made of it weigh only one-half as much as suits of conventional asbestos fabrics. These suits, which are standard equipment aboard aircraft carriers, and at Army air bases, facilitate the fighting of fires and rescues from fire, Likewise, the lightness of the material makes it ideal for use in air ducts and other equipment on planes, and it replaces critical metals."

Many new and unusual applications for this new type of asbestos textile are anticipated by the company in the postwar market.

Motor Shipments to Farmers Increased

A substantial increase in the number of fractional horsepower motors now being shipped to farm equipment manufacturers and direct to farmers was reported to the War Production Board at a recent industry advisory committee meeting.

Both May and June shipping figures and shipping promises from motive power manufacturers to farm equipment manufacturers and farmers show a decided upward trend, but total capacity to produce continues to retain a margin sufficient to replace some small motors that have worn out in use on civilian home appliances, etc.

Committee members of the industry reported that a system of small motor replacement had been perfected that would replace worn out motors with repaired or rebuilt units. However, the WPB strongly urged that local repair facilities be maintained to ease the burden of shipping motors to and from factory sources.

The meeting was under the chairmanship of R. C. Hanna, Chief, Fractional Horsepower Motor Section, General Industrial Equipment Division, WPB.

Postwar Lighting Exhibition Planned

A post-war annual lighting equipment exhibition and congress will be sponsored by the Industrial and Commercial Lighting Equipment Section of the National Electrical Manufacturers Association, according to a recent announcement. The Section believes that there is a definite need for such an exhibition in order to provide opportunity for manufacturers, wholesalers, contractors, public utilities, architects and others to meet and discuss constructive developments and plans in this important war field.

The Section has named nine members of an Exhibition Operating Committee which will make preliminary plans looking toward the holding of the exhibition as soon as practicable after the war.

Southern Section, IAEI Gets New Secretary

Effective at once, G. M. Miller electrical inspector of Richmond, Va., replaces C. M. Jones as secretary of the Southern Section, International Association of Electrical Inspectors. Mr. Jones found it necessary to relinquish his duties as secretary when the Underwriters Laboratories, with which he is associated, transferred him out of the area comprising the Southern Section. For the present, Mr. Jones will be located in Chicago.

Mr. Miller, electrical inspector with the Bureau of Electrical Inspection, City of Richmond, has served the Southern Section as assistant secretary for several months. Effective, immediately, all correspondence with the secretary should be directed to G. M. Miller, secretary, Southern Section, IAEI, 219 Governor St., Richmond 19, Va.

Crosley Manager Endorses Independent Distributors

Throughout the household appliance industry, a controversy is being waged today in regard to an important aspect of post-war merchandising.

As manufacturers are forming policies and making preliminary plans for distribution of domestic products, when conditions may make that possible, they are divided on the question of "Factory branches or distributors".

James H. Rasmussen
Commercial Manager, Crosley

The Crosley Corporation definitely believes that the best job of distribution is to be done through the independent distributor and James H. Rasmussen, Crosley commercial manager, has written to all Crosley distributors and dealers, telling them why Crosley believes this. His letter follows:

"This has long been a highly controversial subject in the radio and appliance industry and it is in the spotlight now because of recent action by several major manufacturers.

"As a result of these manufacturers' termination of independent distributor contracts and the setting up of factory branch distributor operations, many distributors and dealers have requested a statement of policy from us.

" 'Branches versus Distributors' is not a subject which is new to the Crosley Corporation. We have operated branches in several sections of the country—some for more than twelve years. We presently operate three branches located in New York, Chicago and Cincinnati. Several members of our top management have also had wide exper-

ience with other corporations in both branch and distributor operations. We have been actively studying this phase of our business in our Post War Planning program for more than a year.

"Our considered opinion is that independently owned and operated distributorships will deliver a better overall service to the trade and to the consumer for the following reasons—

(1) The American system of free enterprise exist today because of the major contributions that small business has made to "Our way of life". In our opinion, small business has been and will continue to be a powerful force in the shaping of the future of this country.

(2) From a strictly trade standpoint, we believe that distributor management which has money invested in the business will render a better service. There is more "at stake". Final authority, as well as responsibility, is within the distributorship—not at some distant headquarter point.

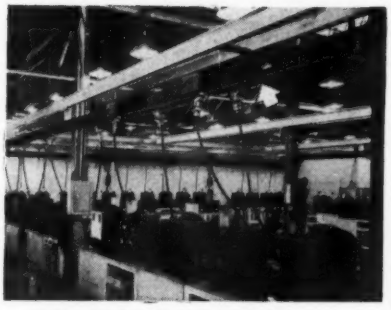
(3) A home owned independent distributor has a more intimate knowledge of local conditions. A home company will be more cognizant of and responsive to the problems of **all dealers**—small and large.

(4) Factory branch managers are inclined to "yes" the factory—to let it go "stale". An independent distributor is freer to criticize and is better able to influence factory policies on product—merchandising and service. Certainly he knows his dealers' credit needs better than a factory treasurer located possibly thousands of miles away.

(5) The independent distributor's employees accept greater responsibility and deliver a better service to dealers because final authority is vested within the local operation.

(6) We believe that with good products and factory programmed merchandising, alert independent distributors will efficiently and aggressively meet and fulfill their enlarged business responsibilities when civilian production is again allowed.

"Many of our distributors have already told us of their Post War Plans, which includes even better service to the trade and consumer and more efficient and economical operation. There will always be a place in American business for progressive independent distributors who have the foresight and the ability to successfully meet the ever changing conditions of our industry . . . We at Crosley believe in their future and shall direct our merchandising policies accordingly."



Flexible Light and Power

Built in standard, interchangeable 10-foot sections, BullDog BUStribution DUCT provides *complete flexibility* on branch power and lighting circuits. The plug-in feature enables you to change production machines at will—rearrange whole departments without interrupting production elsewhere.

BUStribution DUCT is quickly and easily installed—makes sensational savings in maintenance.

Capacities available for Plug-in Type Duct under new WPB standards are 250A, 400A and 600A.

PLUG-IN TYPE for Branch Circuits

(Left) End view of branch circuit plug mounted on a bus duct section—showing how copper "contact fingers" clamp over the busbars in the duct. Plugs are readily interchangeable. Capacities: 30A to 600A; 600 Volts or less.

+ **Increased current-carrying capacity**
+ **Lower operating temperatures**
+ **Lessened voltage drop**
+ **Lighter weight**
+ **Maximum saving in critical materials**
+ **Improved appearance**
+ **Easier maintenance and inspection**

CONFORMS TO WPB LIMITATION ORDER L-273

Ventilated type LO-X Duct for Feeder runs also shares all the basic advantages of BullDog's famous BUStribution DUCT design. It is quickly and easily installed—has full asset value—is 100% salvable. Available in the new WPB ratings of 800A, 1000A, 1350A, 1600A and 2000A. Single-phase, 3-phase, and 3-phase 4-wire; 600 Volts or less.

BULLDOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
BullDog Electric Products of Canada, Ltd.
Toronto, Ontario
Branch Offices in Principal Cities

MANUFACTURERS OF a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Breakers and BUStribution SYSTEMS.

To help win the war, SAVE metals—SAVE fats—SAVE money, BY BUYING WAR BONDS

PERSONAL NOTES
About Men You Know

Appointment of **Ralph C. Stuart** as manager of the Lamp Division of the Westinghouse Electric and Manufacturing Company, with headquarters in Bloomfield, New Jersey, was recently announced by **George H. Bucher,** president of Westinghouse.

Ralph C. Stuart

Mr. Stuart, who has been with the Westinghouse Electric and Manufacturing Company and the Canadian Westinghouse Company for 25 years, will have charge of all activities of the Lamp Division, including sales, illumination engineering, district office activities of the Lamp Division, as well as manufacturing and engineering in the Division's five plants in New Jersey and West Virginia.

Mr. Stuart came to the Bloomfield headquarters plant of the division in January, 1941, being transferred from the West Plant of the Canadian Westinghouse Company at Hamilton, Ontario, where he had been manager from 1930 until 1941.

Mr. Stuart was born in Guilford county, North Carolina, and was graduated from Oak Ridge Institute at Kernersville, N. C., in 1917. He joined Westinghouse at the Bloomfield works in 1918, as an assistant foreman. In September of that year he entered the United States Army, returning to Bloomfield in 1919. The following year he was transferred to the Canadian Westinghouse Company in Hamilton as manager.

* * *

The **George E. Anderson Company,** Santa Fe Building, Dallas, Texas, for 30 years electrical manufacturer's representatives, have been appointed to handle the sales of Federal Electric Products Company's line of safety switches, panelboards and circuit breakers in the states of Texas, Oklahoma, and Arkansas. They will carry in their Dallas warehouse an extremely well assorted stock for on-the-spot service to the trade.

* * *

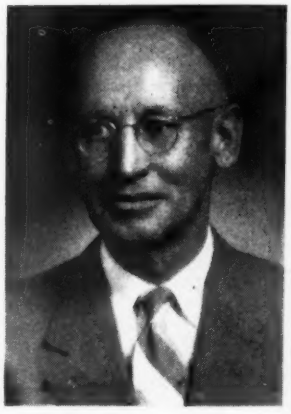
J. J. Mitchell, vice president in charge of sales, BullDog Electric Products Co., Detroit, has announced the appointment of **H. H. Benfield** as Eastern Division manager to supervise and direct the activities of the district office at Boston, New York, Washington, Philadelphia, Syracuse and Buffalo. Mr. Benfield, who has been New York district manager for BullDog since December, 1941, will make his headquarters at the New York office.

Distinguished by his success in promoting the original use, application and marketing of thin wall conduit, Mr. Benfield was formerly sales manager of Steel and Tubes Division of Republic Steel Company.

H. H. Benfield

Effective immediately **J. A. Taylor,** formerly sales representative at Pensacola, Florida, becomes manager of Graybar Electric Company's Birmingham house. Mr. Taylor, a native of Cherokee County, Georgia, has been with Graybar over 20 years, nearly 18 of which have been spent in Alabama and Western Florida.

Mr. Taylor is well known in Birmingham, as well as throughout the state. During the construction of Wheeler Dam and power plant, he had charge of his company's temporary location at Florence, returning afterwards to Pensacola as resident salesman.



J. A. Taylor

During the first World War, Mr. Taylor was in the United States Naval Air Service and spent 14 months in France. He is married and has two young daughters.

A. D. Hammond, whom Mr. Taylor succeeds, has been appointed district manager at Cincinnati. His 37 years with Graybar include service at Nashville, Atlanta, Miami, and Birmingham, where he has been manager since 1935.

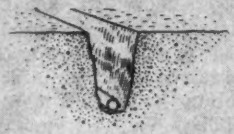
* * *

Fred B. Wipperman, well known manufacturers' representative of St. Louis, Mo., has been named executive secretary of the National Industrial Service Association, Inc., an association of electric motor repair shops. At the same time, the national headquarters of the association has been moved to 200 North Broadway, St. Louis.

Mr. Wipperman is a native of Indiana and a graduate engineer. He served with the 311th Engineers in World War I, and upon leaving the Army, entered the employ of the Wagner Electric Com-

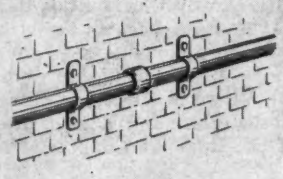
DO YOU KNOW THESE FACTS ABOUT TRANSITE DUCTS?

TRANSITE CONDUIT

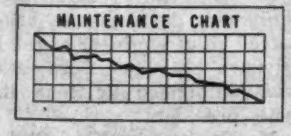


This durable duct is for use underground, or on exposed locations without a protective casing . . .

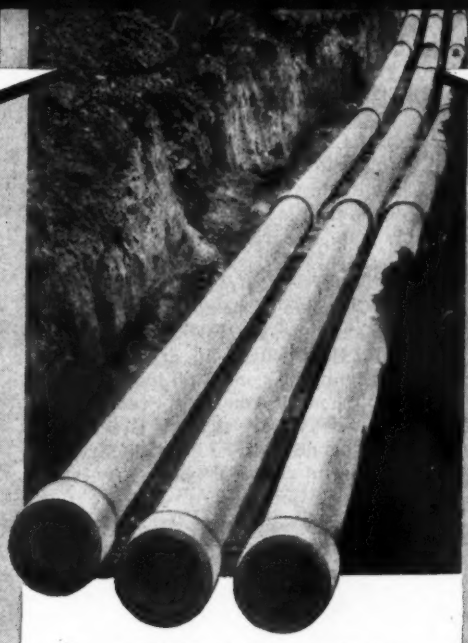
Under sustained earth loads and traffic pressure, it maintains its strength and true form . . .



Transite Conduit effectively resists weather, smoke and fumes...is virtually unaffected by corrosive soils...



Its cost is low and, in service, it is much more economical than other materials of comparable strength and durability.



. . . In addition, both Transite Conduit and Transite Korduct have these characteristics . . .

1. Incombustible—Made of asbestos and cement, they cannot burn . . . will not contribute to the formation of dangerous smoke, fumes or gases.

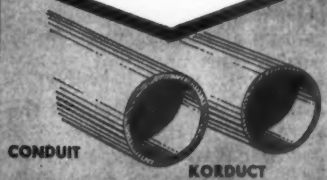
2. Immune to electrolysis . . .Transite Ducts are non-metallic and inorganic . . . unaffected by electrolysis.

3. Smooth bore—Making cable pulls easier, both at initial installation and after years of service.

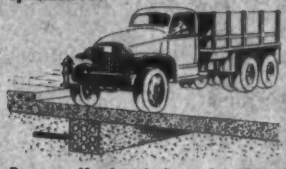
4. Easily installed—Lining up is fast and accurate because Transite Ducts combine light weight, long lengths, simple assembly.

For details and specifications, write for Data Book DS-410. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

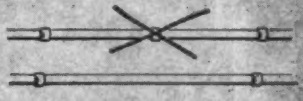
TRANSITE KORDUCT



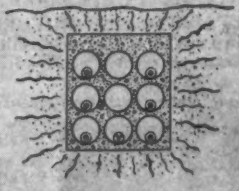
Thinner walled, lower priced than Transite Conduit, Transite Korduct is for use where an encasement is specified . . .



Because Korduct is incombustible, less concrete is required between ducts to provide the necessary degree of fire protection.



Its long lengths (10 feet) mean fewer joints, reducing the number of spacers required . . .



Its high rate of heat dissipation lowers cable operating temperatures . . . increases system capacity . . .

JM Johns-Manville

TRANSITE DUCTS

TRANSITE KORDUCT— for installation in concrete

TRANSITE CONDUIT— for exposed work and installation underground without a concrete encasement

pany, in St. Louis. He served the Wagner Company for approximately 12 years in various capacities, including special testing, research, engineering and sales.

Since 1933, Mr. Wipperman has been a manufacturers' agent with headquarters in St. Louis and, at the present time, represents Railway & Industrial Engineering Company and the Electroline Company in the territory comprised of Arkansas, eastern Missouri, and southern Illinois.

* * *

The appointment of **Ralph J. Cordiner** as assistant to the president of the General Electric Company has been announced by **Gerard Swope,** president.

Mr. Cordiner, who resigned in June as vice chairman of the War Production Board, was formerly president of Schick, Inc., of Stamford, Conn., prior to which he was manager of the appliance and merchandise department of the General Electric Company.

* * *

J. M. Moore has joined The Silex Company, Hartford, Conn., as sales promotion manager. He was formerly supervisor of sales offices and merchandise manager of the Union Electric Company, of Missouri, and the St. Louis County Gas Company. He is a member of the St. Louis Electrical Board of Trade and Past Secretary of the St. Louis Housewares Club.

* * *

Mark G. Mueller has been recently appointed sales representative for the Railway and Industrial Engineering Company for the Denver district. Mr. Mueller is a graduate of Iowa State in Electrical Engineering in 1923. He was a sales engineer for Century Electric Company for 11 years, covering the Pittsburgh, Kansas City and Denver territory. In 1932 he became established in Denver as a sales representative.

* * *

Creation of a Sales Research and Development Division headed by **W. H. Cordes,** advertising manager of the company, has been announced by American Steel & Wire Co., subsidiary of U. S. Steel Corp.

The new division will carry on the study of post-war markets for existing products of the company and also will study and investigate the effect of the use of substitute materials and new application of old ones. In addition, it will explore new ideas for new products and possible new uses for normal products. Also to be considered is the possible need for altered distribution and merchandising methods in the faces of changes in existing practices.

Mr. Cordes has been with American Steel & Wire for 30 years, most of which has been in the advertising department. He has been manager of sales promotion and advertising since 1935.

* * *

The appointment of **Carl C. Coon** as G-E wiring materials field representative in Virginia and North Carolina with headquarters in Roanoke, Va., is announced by **J. H. Crawford,** manager of the construction materials divisions of General Electric Company's Appliance and Merchandise Department at Bridgeport, Conn. Mr. Coon reports to **J. O. Wetherbie,** New York City, manager of District No. 2 of the G-E wiring materials field force. He replaces **J. M. Murphy,** who joined the Navy, receiving the commission of lieutenant (j.g.) in the U. S. Naval Reserve.

Mr. Coon has been associated with Dowdy Electric Co., Roanoke, Va., and has been in the electrical contracting business for 20 years. He is a former vice president of the Virginia Electric Contractors' Association and a past president of the Roanoke Chapter of NECA.

* * *

Palmer M. Craig, for the past two years chief engineer in charge of radar and radio communications equipment development, has been named chief engineer of the Radio Division of Philco Corporation, it was announced by **John Ballantyne,** president.

Mr. Craig joined the Philco Research Laboratories as a radio engineer in 1933 and assisted in the development of such important contributions to radio as high fidelity reception, automobile radios and the first remote control radio receiving sets. He was appointed engineer in charge of console radios in 1938 and, even prior to the attack on Pearl Harbor, Mr. Craig was taking a leading part at Philco in the development of radar equipment.

This gives you some idea of the difference in efficiency and RESULTS—when you use the ultra-modern BRIEGEL METHOD of making thin wall conduit connections instead of many old-fashioned methods still on the market.

***You conserve critical steel*—Briegel fittings are made with 25% less steel than any other fittings on the market.**

***You save time*—just two squeezes with the patented B-M "indenter" (illustrated at left) and a smooth, clean connection is made. No extra turns or twists—no nuts to tighten. Up to 50% saving on precious time!**

***You save materials*—fewer items to buy and handle. MORE PROFIT ON EVERY JOB!**

Approved by Underwriters' Laboratories.
Prompt Deliveries on All Properly Rated Orders!

THE ONLY TOOL YOU NEED (COSTS JUST $1.25)

DISTRIBUTED BY

The M. B. Austin Co.
Chicago, Ill.
Clayton Mark & Co.
Evanston, Ill.
Clifton Conduit Co.
Jersey City, N. J.
General Electric Co.
Bridgeport, Conn.
The Steelduct Co.
Youngstown, Ohio
Enameled Metals
Pittsburgh, Pa.
National Enameling & Mfg. Co.
Pittsburgh, Pa.
Triangle Conduit & Cable Co.
New Brunswick, N. J.

BRIEGEL METHOD TOOL CO., Galva, Ill.

How FRIGIDAIRE'S WARTIME PLAN has helped dealers "keep 'em running"

Back the Attack—
with War Bonds

EARLY in 1942, when it became apparent that existing refrigeration equipment could not be replaced, Frigidaire intensified its efforts to help dealers solve the many problems confronting them.

Because this Wartime Conservation program was based on the wide experience of factory specialists, as well as actual experiences in the field, it has been unusually successful. Covering all phases of service activities from factory to user, it has helped Frigidaire dealers perform an outstanding service job during a very critical period.

Moreover, the Wartime Conservation program is not a one-time affair. It is of continuous help, with up-to-the-minute information and suggestions constantly flowing to the field organization as new problems arise. Here are a few of the reasons why Frigidaire dealers are so enthusiastic about this program:

Factory-Conducted Meetings have been held in all parts of the country to acquaint dealer and district personnel with first-hand details of the Conservation program. Factory specialists are also in touch with the field constantly to lend assistance wherever and whenever they can.

District Meetings and other means have been used to show dealers how to set up an inexpensive service shop; how to conserve time and expense by proper diagnosis of service complaints; how to conserve parts by repairing instead of replacing; how to build customer good will; and how to maintain identity as service headquarters.

Field Training Schools conducted by factory and district instructors have been of great assistance. Hundreds of new and experienced servicemen have received fundamental and advanced training in Household Refrigeration, Commercial Refrigeration, and Electric Range work. Night School classes have been very popular.

A Correspondence Course, over a period of 16 weeks, has had an enrollment of more than 5,000 students. This course embraces Household and Commercial subjects, from basic to advanced information. Personal aid and encouragement are given to each student by district service specialists when grading lessons.

Training Films have been made available to help new servicemen and to "refresh" veterans. Films cover such subjects as "Changing Sealed Rotary Units in Various Style Cabinets," "Service Operations on Household Reciprocating Systems," "The Easy Way to Service and Diagnose the Sealed Rotary System," "Service Operations on Ice Cream Cabinets," and "Servicing Wet Storage Beverage Coolers."

Handy Reference Guides help new servicemen and veterans alike. These easy-to-follow pocket size manuals have proved to be invaluable aids to more intelligent and quicker diagnosis.

Factory Bulletins and the dealer newspaper, the BTU News, are issued regularly to keep the service organization abreast of latest service developments. They also publicize the successful experiences of others and tell the "what, why and how."

Adequate Parts for keeping millions of Frigidaires operating are an important factory responsibility. A large Parts manufacturing department produces, repairs and feeds parts to depots strategically located throughout the country. From there they are distributed to servicing dealers.

Conservation of Critical Materials, affecting the manufacture of hundreds of parts items, has been an important means of assuring the parts and assemblies needed by Frigidaire's servicing dealers.

A continuous major program to help dealers accomplish these 5 important objectives

1. To cooperate with the Government's Food Conservation and Health Protection Program.
2. To help keep the millions of the nation's refrigerators running.
3. To help dealers locate and train necessary service manpower.
4. To help dealers obtain essential service parts.
5. To help dealers build good will and maintain income.

For Excellence in War Production

Every Sunday Afternoon: GENERAL MOTORS SYMPHONY of THE AIR, NBC Network

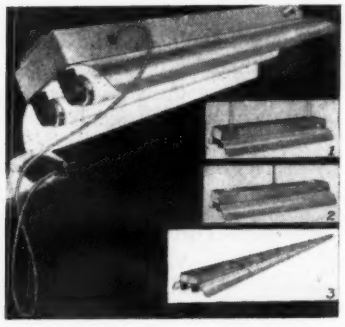
FRIGIDAIRE Division of GENERAL MOTORS

Peacetime builders of Home Appliances, Commercial Refrigeration, Air Conditioners

NEW EQUIPMENT and MATERIALS

All-Purpose Industrial Unit

This new low cost all-purpose industrial unit, using 20 watt fluorescent lamps, designed, engineered and manufactured by the Mitchell Manufacturing Company, 2525 N. Clybourn, Chicago, Illinois, provides much needed "extra" light for close and critical seeing tasks. It is especially useful for high intensity, localized lighting of production, assembly, and inspection lines, and for lighting over benches, machines, tables, etc.



It is quite easy to install. Simply hang it up and plug it in as indicated in the illustration. The unit comes complete with 6-foot cord and plug. Knockouts also are provided for rigid (conduit) mounting (see No. 2 above.) Singly, in twin groups, or continuous rows. (See No. 3, above.) Also available at a small additional cost are 8-foot chains. (See No. 1, above.) Strong, sturdy steel wireway construction, with knockouts at both ends.

This Model, No. 2060, has specially designed reflector made of "Lumenite", a durable, moisture-resistant composition that provides a maximum light output. The unit is furnished in attractive gray outside, high gloss hard finish white inside. It has the latest type ballasts, sockets and FS-2 starters. The starters are easily accessible on the side of the wireway channel. The units operate on 110-125 volts, 60 cycles, alternating current. Dimensions: 4½" in height, 24" in length, 9½" in width. For further details and list prices, write the manufacturer.

Revere Combination Unit

The new Revere combination mercury and incandescent lamp dome reflector is designed to fulfill the need for illumination approaching daylight on both flat and vertical surfaces. An incandescent lamp is used in combination with a mercury lamp. The reflector is shaped to give wide even distribution of light with a minimum of direct glare and together with the hood, embodies features which dissipate heat accumulated from the lamps. Hood and reflector are of heavy gauge steel porcelain enameled white inside and green outside. Lamp wattage is 250 watt mercury and 300 watt incandescent.

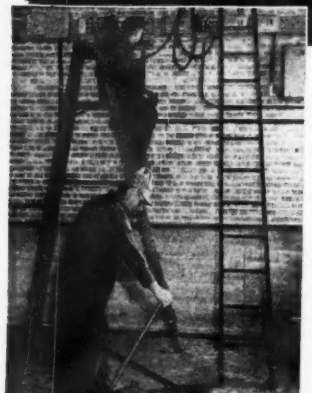
Wherever light of more natural color rendition is desired, especially where heavy equipment is in use or where colored materials are being handled or manufactured, this unit offers excellent possibilities. Further information will be supplied by writing the manufacturer, Revere Electric Mfg. Co., 2949 N. Paulina Street, Chicago, Ill.

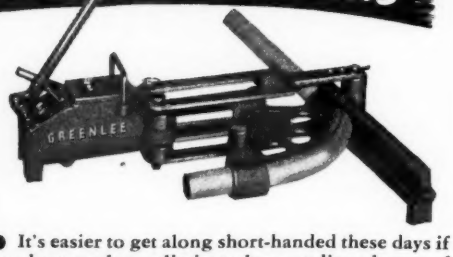
Magno-Tronic Ballast

Industrial Electronics Corporation, of Newark, N. J., has announced a new Magno-Tronic ballast with "Perma-Gap" that assures economic, efficient fluorescent lighting.

All Magno-Tronic fluorescent lamp ballasts or transformers have the patented "Perma-Gap". These ballasts control the flow of current into the lamp as close as 99.99% and is set within ½ of 1%. This control prevents premature black ends—deterioration of the cathodes and emission coating. The ballast contains a non-magnetic alloy in the gap, the melting point of which is approximately 1400

EXTRA MANPOWER with GREENLEE BENDERS





Shown above is the Greenlee No. 770 Bender with radius shoe attachment. With one forward stroke of the ram, a smooth, neat-looking, 90° bend is made in a jiffy.

● It's easier to get along short-handed these days if you have tools to eliminate long, tedious hours of hard work. And there's less absenteeism, too, when you have tools that lessen the physical strain on your men. Good tools provide extra manpower—help get more work done—speed up jobs. When you need better tools for essential jobs, investigate the current line of Greenlee Tools. You'll find Greenlee Benders, for instance, will provide extra manpower for all bending jobs, large or small. They are powerful, portable, easy for one man to operate.

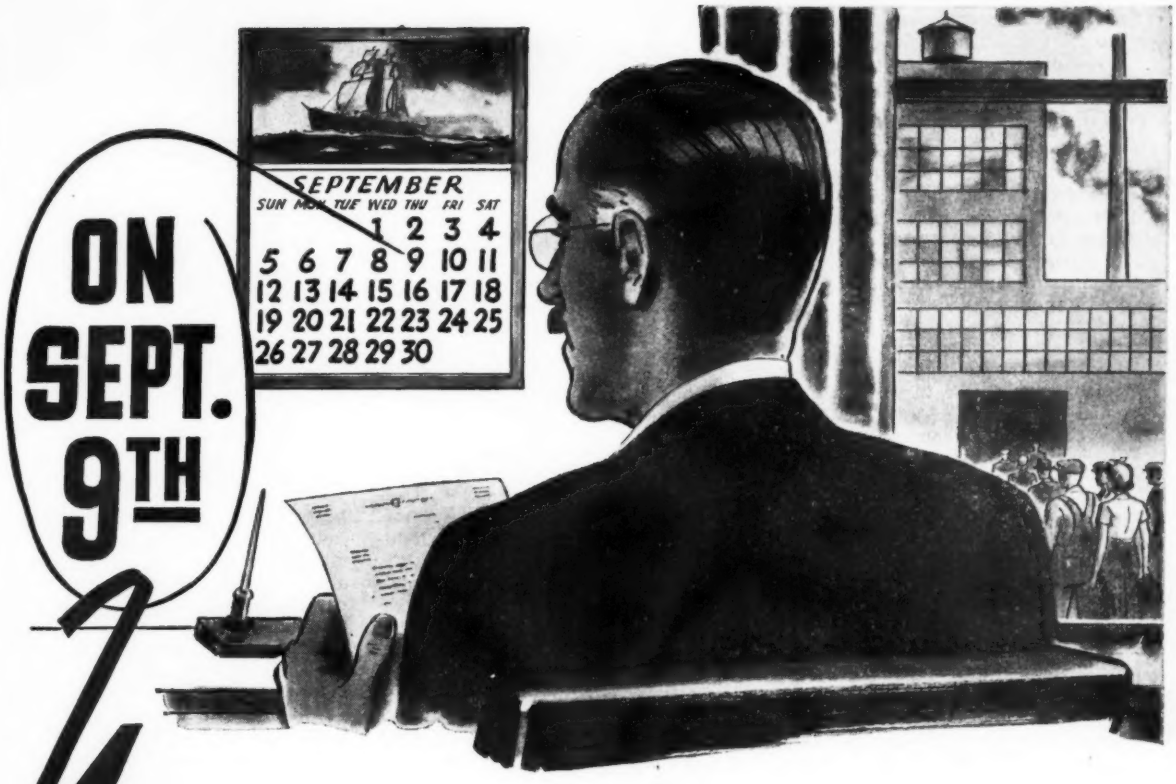
There's A Greenlee Bender For Every Job!

Whatever you have to bend—tubing, E.M.T., heavy-wall conduit, or bus bar—there's a Greenlee Bender, including powerful hydraulic units, that will help ease your manpower problems.

SEND FOR BENDER BOOKLET NO. 5-116

Greenlee TOOL CO.

1769 Columbia Ave. • Rockford, Illinois



Your Bond Selling Responsibilities Double!

Starting September 9th, your Government will conduct the greatest drive for dollars from individuals in the history of the world—the 3rd War Loan.

This money, to finance the invasion phase of the war, must come in large part from individuals on payrolls.

Right here's where YOUR bond selling responsibilities DOUBLE!

For this extra money must be raised *in addition* to keeping the already established Pay Roll Allotment Plan steadily climbing. At the same time, every individual on Pay Roll Allotment must be urged to dig deep into his pocket to buy *extra* bonds, in order to play his full part in the 3rd War Loan.

Your now *doubled duties* call for these two steps:

1. If you are in charge of your Pay Roll Plan, check up on it at once—or see that whoever is in charge, does so. See that it is hitting on all cylinders—*and keep it climbing!* Sharply increased Pay Roll percentages are the best warranty of sufficient post war purchasing power to keep the nation's plants (*and yours*) busy.

2. In the 3rd War Loan, every individual on the Pay Roll Plan will be asked to put an *extra two weeks salary* into War Bonds—over and above his regular allotment. Appoint yourself as one of the salesmen—and see that this sales force has every opportunity to do a real selling job. The sale of these *extra* bonds cuts the inflationary gap and builds added post-war purchasing power.

Financing this war is a tremendous task—but 130,000,000 Americans are going to see it through 100%! This is their own best *individual* opportunity to share in winning the war. The more frequently and more intelligently this sales story is told, the better the average citizen can be made to understand the wisdom of turning every available loose dollar into the finest and safest investment in the world—United States War Bonds.

★ ★ ★

BACK THE ATTACK With War Bonds!

This space is a contribution to victory today and a sound business tomorrow by ELECTRICAL SOUTH

degrees centigrade. The laminations are made of the finest silicon dynamo steel which helps in maintaining a low operating temperature. Brass braces are used to keep the laminations from contracting beyond their setting point. The copper coil is wound to close precision tolerances.

According to the manufacturer the "Perma-Gap" ballast offers the following advantages: long fluorescent lamp life, sufficient starting current to adequately preheat the lamp cathodes, proper characteristics so that the lamp operates at its normal voltage and wattage, regulation that will not be destroyed by line voltage fluctuations, low wattage loss, minimum operating temperatures, and low noise level.

The patent on our Magno-Tronic ballast was allowed late in the summer of 1943 after many years of experimentation were spent in perfecting this scientific device.

All Magno-Tronic fluorescent lamp balasts are guaranteed for two years, and will serve a life time if not abused.

Plastic Lighting Units

In harmony with the War Production Board suggestion regarding the most efficient use of industrial manufacturing facilities, the F. W. Wakefield Brass Co., of Vermilion, Ohio, has arranged to manufacture for the duration of the war the Chase line of plastic lighting units.

Augmenting the well-known Wakefield "Commodore" units, the former Chase products are offered in two styles—the Commander (formerly the Midas line) and the Alden.

Little, if any, difference in lighting efficiency exists between the units. However, the individual styling is different and the buyer is afforded a wider choice in the design of semi-indirect lighting plastic reflectors.

Plaskon, an urea formaldehyde plastic, now has a definite place in the lighting industry and has been recognized as a standard for a reflecting medium. The weight is approximately only one-quarter of that of other reflecting mediums of comparative size, and they are not subject to breakage due to temperature changes.

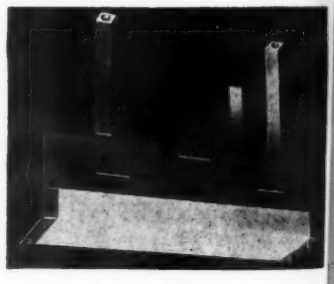
Cleaning the bowl is simple. Neither hot nor cold water affects the reflector. They can be cleaned by merely wiping them with a damp cloth.

The new Commander line is offered in wattages from 200 to 750 watts and is available in either close connected ceiling or semi-rigid suspension types. Chase catalog numbers have been retained to facilitate ordering by previous purchasers.

Marine Fluorescent Fixture

A fluorescent lighting fixture for marine use is announced by Curtis Lighting, Inc., of Chicago, Ill. Because this unit is resistant to shock, vibration and oscillation, it is suitable for vessels such as Coast Guard Cutters, etc., and may be used in industrial plants where these factors must be taken into consideration.

The unit employs two 15-watt fluorescent lamps. The tulamp ballast, lampholders, starter sockets and special terminal block can be removed from the housing as a complete unit, without dismounting the fixture from the ceiling or from the mounting brackets. The Louverplas



shield used in the unit gives wi diffused illumination with effectiv lamp concealment and eliminates ob jectionable brightness from norma viewing angles.

The housing has a rust-resistan plated coat, one coat of zinc chromat primer and one coat of battleshi gray enamel. Interior is finishe white enamel; reflector, chrome pla ed steel; diffusing cover, Louverplas unit housing and mounting strap steel; lampholders, plastic.

Presto Reflector Release

The new Smithcraft fluorescent lighting unit is featuring a simple practical device for quickly releasing and replacing the reflector. Th device greatly facilitates installation and maintenance of the unit under varying conditions. By a single turn

When range units need replacing

use **CHROMALOX HEATFLO**

THEY FIT ALL RANGES — you can serve all customers from a limited stock.

THEY COOK THE MODERN WAY — with black heat, conserving vitamins, juices, flavors.

THEY COOK BY CONTACT — saving time and power.

THEY ARE MOST EASILY CLEANED because of their all-flat top.

Thousands in service long before Pearl Harbor. Write for details.

ATLANTA, GA.—C. B. Rogers, 1000 Peachtree St. DALLAS, Texas—L. R. Ward, 403 Southland Building Annex. RALEIGH, N. C.—W. R. Phillips.

EDWIN L. WIEGAND CO., 7525 Thomas Blvd., Pittsburgh 8, Pa.

of two wing nuts the reflector is released. Another turn and it's back again. See circle inset.

The wing nuts carry captive hood bolts which slide in and out of a pair of covers which are a part of two cross bridges welded to the housing. The cross bridges gives additional strength to the new die-formed steel housing, which conforms to all government regulations. Made by A. L. Smith Iron Co., Chelsea, Mass., Manufacturers of individual units and specially designed continuous systems.

Guth Super-Illuminator

Strength by method-in-design, features the new Guth Super-Illuminator. To compensate for W.P.B. steel limitations, Guth engineers have developed a die-formed one-piece full channel, with unique metal "bends" (patents applied for) that provide greater channel-strength on the horizontal and on the torque.

The new Super-Illuminator is available in sizes for 2-40, 3-40, and 2-100 watt fluorescent lamps. All wiring and auxiliaries are fully enclosed. Positive "flexible trigger" supports allow quick, easy reflector removal. Starter switches are accessible without removing lamps, and bump-proof end-plates give added lampholder protection. Super-Illuminators are listed by Underwriters' laboratories, Inc.

Reflector is Guth-formed Masonite "Reflector-Board" and is finished "300° WHITE" high-baked synthetic enamel. Eggcrate louvres are available for lamp shielding, where desired. Immediate shipment can be made. For further details write the Edwin F. Guth Company, 2615 Washington Ave., St. Louis, Mo.

Plastic Saves Metal

To meet wartime needs and release of critical materials such as brass and steel, the engineers of McGill Manufacturing Company, Inc., at Valparaiso, Indiana, have added another

NEVER BEFORE

A BALLAST LIKE THIS!

A Superior oscilloscope wave-form showing true power saving wave-form produced by Superior's patented ballast design, increasing foot candles and lengthened lamp life.

B Competitive oscilloscope wave-form produced by competitive ballasts of similar design, demonstrates approximate 25% loss of power and light output. This will result in complete blackening of lamp ends and shortening of lamp life.

THOROUGHLY TESTED
SUPERIOR
THOROUGHLY PROVEN

A few users:
Mitchell Mfg. Co.
Westinghouse Elec. Supply Co.
General Electric Supply Corp.
Graybar Electric Company, Inc.
Ruby Lighting Co.
Progress Mfg. Co.
Electro Mfg. Co.
Lighting Products Corp.
American Fluorescent Co.
L. J. Segil & Co.
Solar Lighting Co.
Von Dyke Industries

AVAILABLE FOR IMMEDIATE DELIVERY

Not Just An Ordinary Ballast

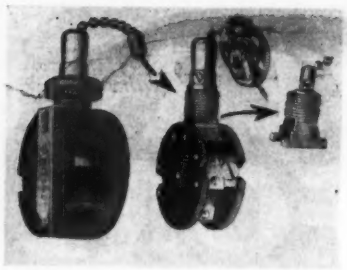
It's CUSTOM *and* PRECISION BUILT THROUGHOUT!

Unbiased operating tests prove that Superior Ballast provides approximately 25% more lamp life than similarly designed ballasts. It was found that Superior Ballast also increased the useful light output of the lamps by retarding the blackening of the lamp ends. Ballast, engineered and manufactured in Superior's new plant, is of exclusive patented design—a design that overcomes the faults commonly found in ballast of less advanced design. There is a Superior Ballast made for every type of fluorescent unit.

WRITE FOR DESCRIPTIVE LITERATURE

SUPERIOR ELECTRICAL INDUSTRIES

DEPT. F., 2614 W. NORTH AVE., CHICAGO, ILLINOIS



development to the No. 1010 Plastic Shell Levolier Switch. Recently the switch was redesigned with a plastic casing in place of the former brass shell, which change released enough brass to produce approximately four million .30 calibre shells per year.

An additional saving in critical metal is now effected through the use of a plastic material in the fabrication of a frame to which the top and bottom disks are secured. The front member of this frame is threaded to take the mounting nut.

Synthetic Baking Varnish

Valuable information on baking and vacuum impregnation of electrical units with insulating varnish is now available. This information is incorporated in the new colorful six page folder on Dolph's Synthite PG-1 Clear Baking Varnish.

Synthite PG-1 clear baking varnish is composed of synthetic resins and vegetable drying oils skillfully blended to produce a finish which offers extra protection to electrical units. One advantage in using this insulating varnish is that it may be baked to any degree of hardness. Today, this is essential as many new control armatures rotate at very high speeds and require a varnish which will hold windings intact under terrific centrifugal force. As Synthite PG-1 cures by heat induced chemical polymerization, it will not resoften even under the heat developed by some types of units. As a matter of fact, there is a tendency for the varnish to become harder when subjected constantly to high operating temperatues.

A copy of this helpful folder may be obtained by writing to the John C. Dolph Company, Dept. 23, 168 Emmett Street, Newark, New Jersey.

Ideal Maintenance Book

Recognizing that war plants are running 24 hours a day, 7 days a week, which means that their equipment is wearing out rapidly, Ideal Commutator Dresser Co., Sycamore, Ill., has issued a new Maintenance Handbook which tells how to keep

motors and generators operating continuously at peak efficiency without dismantling. Other IDEAL Equipment is also illustrated and described, including: industrial electrical equipment, variable speed transmissions, machine tool accessories, wiring devices and tools, and rechargeable battery for flashlights.

Every page, from cover to cover, (38 pages in all) is crammed full of valuable information to anyone interested in speeding up war production. Copy available upon request.

"Multifit" Connectors

Straight connectors and reducers, tees, and terminal lugs are included in the new line of Multifit Connectors just completed and put into production by Penn-Union Electric Corporation.

Every fitting in the new Multifit line can be used for a wide range of conductor sizes. For example, one tee takes any cable from 1/0 to 300 mcm on either run or tap—and full torque will be exerted on conductors of every size.

Multifit connectors grip the conductors by means of U-bolts with integral saddles, providing generous holding area and distributing the pressure on the conductor.

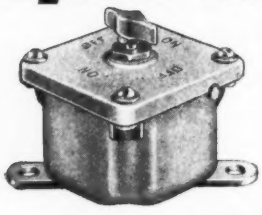
Every Multifit connector is extremely substantial, with an exceptionally wide margin of mechanical strength and conductivity.

75 Footcandles Usable Light in Sewing Room

(*Continued from page 58*)

lighting source. The average artificial illumination is measured at 25 footcandles and is delivering a good quality of evenly distributed light which is characteristic of this type equipment. Large areas

Spero *can make prompt delivery of the following 9-S Navy and Marine Fittings*



9-S BASIC BOXES

5333—3" Basic Steel Enclosure (WT)
5334—4" Basic Steel Enclosure (WT)
5335—5" Basic Steel Enclosure (WT)

9-S DEVICES AND SWITCHES

4234-L G-S(W.T.)
4260-L E-S(W.T.)
4262-L F-S(N.W.T.)
4264-L F-S(W.T.)
4264-L G-S(W.T.)
4264-L F-IS(W.T.)
4264-L G-IS(W.T.)
4348-L H-S(N.W.T.)
4477-L V-111(W.T.)
4496-L C-S(W.T.)
4563-L M-S(N.W.T.)
4563-L N-S(N.W.T.)
4563-L M-IS(N.W.T.)
4563-L N-IS(N.W.T.)
4718-L CC-S(W.T.)
4718-L DD-S(N.W.T.)
4719-L FF-S(W.T.)
4719-L GG-S(N.W.T.)
4720-L TT-S(W.T.)
4721-L MM-S(W.T.)
4777-L V-IS(W.T.)
4816-L FFF-IS(W.T.)
4816-L FFFS(W.T.)
4873-L GG-S(W.T.)
4914-L MI-S(W.T.)
4923-L IX-S(W.T.)
5174-L V-S(W.T.)

9-S FIXTURES

4341-L V-111-S(N.W.T.)
4341-L IX-S(N.W.T.)
4341-L V-111-A-S(N.W.T.)
4535-L J-S(White,W.T.)
4535-L JR-S(Red,W.T.)
4535-L JG-S(White,W.T.)
4535-L JRG-S(Red,W.T.)
4536-L J-S(White,W.T.)
4536-L JR-S(Red,W.T.)
4537-L L-S(White,W.T.)
4537-L LR-S(Red,W.T.)
4537-L LGS-S(White,W.T.)
4537-L LRGS-S(Red,W.T.)
5121-L 111-ES(White,W.T.)
5122-L IV-ES(White,W.T.)
5163-L LL-S(White,N.W.T.)
5163-L LLR-S(Red,N.W.T.)
5163-L LLGS-S(Red,N.W.T.)
5163-L LLRGS-S(Red,N.W.T.)
5173-L JS-S(White,W.T.)
5173-L JRS-S(Red,W.T.)
5173-L JGS-S(White,W.T.)
5173-L JRGS-S(Red,W.T.)
5186-L LS-S(White,W.T.)
5186-L LRS-S(Red,W.T.)
5186-L LGS-S(White,W.T.)
5186-L LRGS-S(Red,W.T.)
5262-L (W.T.)

N. Y. Office: 33 West 42nd St., N. Y. C.

THE SPERO ELECTRIC CORPORATION
18222 LANKEN AVE. ★ CLEVELAND, OHIO

of low brightness contribute greatly to the comfort of the operators.

Local lighting at the working point is provided by small industrial units mounted on the machines, which employ a small mazda "C" light source. Here the intensity is measured at 75 foot-candles and is all "usable light" since the lamps are well shielded by properly designed reflectors. The proper relationship which insures balance between general and local sources is correctly applied in this installation.

Electric Institute Plans Service Program

(Continued from page 35)

manpower formerly available.

The survey shows that fully 50 per cent of the present manpower is vulnerable to draft within the near future. The Institute through the data it has gathered from its survey, will show the War Manpower Commission and the District Selective Service that it is essential that all the available repair service manpower be maintained for the health and safety of civilian economy.

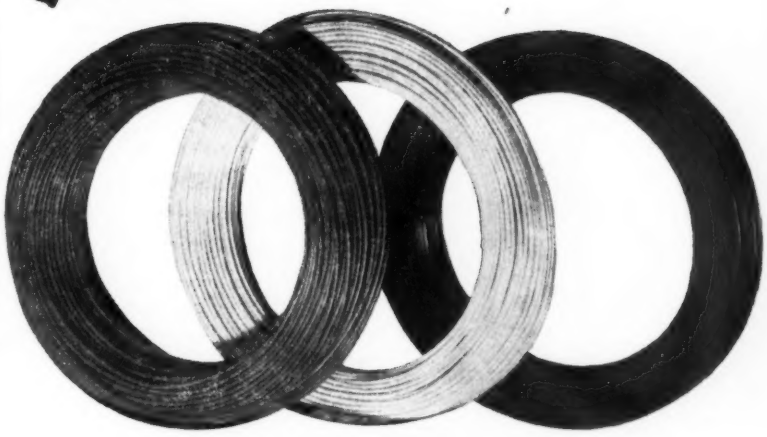
Only inexperienced men are now available for replacements. The Institute has made it a point to secure enough men mechanically inclined or amenable to mechanical instruction to be enrolled in a service or repair training class so that they may qualify for replacements.

Facts developed through the survey show that the average repairman must undergo four years of training and experience in order to become an A-1 repair or serviceman.

While the four-year period of training is deemed necessary to turn out a full-fledged repair man, the actual time required to train the men varies considerably. It is pointed out it has been found that it takes from three to five years to develop a trained refrigerator repair man, motor rewinder or radio mechanic; two to three years for washer, small appliances, etc.

Such training time is not now available, it is pointed out by the Institute and in order to reach a minimum of efficiency for safe repair standards, the Institute feels all trained personnel capable of training others will be needed in the industry until the first of the next year, and as the replacement

FOR ALL War Wiring



FLAMENOL* BUILDING WIRE

TYPE SN

Use this small-diameter thermo-plastic building wire for all war-purpose wiring jobs. It is available in sizes 14 and larger. Flamenol Building Wire is ideal for maintenance wiring . . . for re-wiring . . . for new wiring. Its small diameter, comparative light weight and smooth finish make it easy to hand e. Its insulation is superaging, high in dielectric and mechanical strength, flame retarding and resistant to oils, moisture, acids, etc.

You can obtain this dependable wire now because the available supply of resins has improved. They are permitted for electrical conductor insulation wherever copper is allocated.

For further information on Flamenol Building Wire, see the nearest G-E Merchandise Distributor or write to Section W931-16, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

*Reg. U.S. Pat. Off.

GENERAL ELECTRIC

"SHERARDUCT" IS THE SHERARDIZED CONDUIT

Rustproofed INSIDE AND OUT

Even at the base of the threads

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.

curve climbs, it will allow for the gradual withdrawal of the less experienced group subject to the draft.

For training purposes a course of instruction in refrigeration servicing will soon be launched under direction of Joseph Doyle, manager of service activities of the Electric Institute. It will consist of theory and demonstration. The service managers of eight of the refrigeration servicing agencies will comprise the corps of instructors. The course will be conducted for twelve weeks. Each of the instructors will confine his instructions to one particular phase, as for example controls, compressors, etc.

Survey of Postwar Lighting Trends

(Continued from page 34)

lighting is a part, is designed to affect employee comfort and, therefore, employee and plant efficiency.

Schools—Similar controlled environment plans have been suggested by one educator. He advocates underground schools having controlled lighting, air conditioning, etc., with an out-of-doors playground on top at ground level to solve problems of space for schools in city and partially-congested areas.

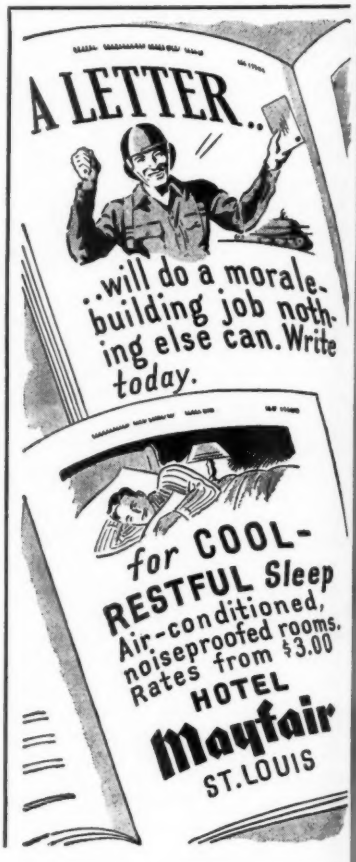
We have arrived at a fairly high standard of school lighting with indirect and semi-indirect artificial lighting, comfortable wall colors, scientific control of natural light, and photo tube control of artificial light. There is, however, much yet to be done if we are to completely condition classrooms to students and to the changing visual tasks of the modern school. An enlightening article on the subject by Charles D. Gibson, of the California State Department of Education, was reprinted in the June, 1943, issue of *Illuminating Engineering*. Fluorescent lighting will probably play an increasing part in the school lighting of tomorrow.

Offices—There is a definite trend toward office comfort with air conditioning and noise reduction. The use of standardized acoustical materials on the ceiling will undoubtedly lead to an expanding use of corresponding standard units of built-in and troffer-type of lighting. We must not overlook two other items that assist in office seeing comfort—suitable wall colors and finishes, and light-colored desk tops to reduce contrast.

Drafting Rooms—In quite a few recently-lighted drafting rooms the troffer fluorescent lighting rows are placed at 45° to the axis of the room to average out the shadows from tee-squares and triangles. Shielding from direct and reflected glare is important in this area of exacting and sustained seeing. Drafting boards placed more vertically instead of horizontally are said to be more comfortable.

Stores— Store owners are being denied new lighting and may have to sacrifice more yet. Store lighting will undoubtedly be one of our first large important jobs after the war. Let us hope that the store owner's desire to have new lighting does not lead him to install inappropriate equipment.

The lack of clerks has led many stores to institute self-service centers, tables and shelves. Even before the war, many west coast markets were entirely selfservice, and there was a trend in several



other kinds of stores toward eliminating the counter and making all shelves and cases accessible to the customer. This self-service trend will require that there be a better appraisal lighting at the point of self service; the customer must accomplish with his eyes what the well-trained clerk says in words.

We believe that lighting fixtures in stores must be less conspicuous and better coordinated with the interior treatment. Tints of colored light as decorative wall, ceiling and background treatments may come. The 3-A plan, "lighting for atmosphere, attraction and appraisal," inaugurated just before Pearl Harbor, should be a safe philosophy with which to start when peace comes.

Homes—If the color of fluorescent lighting can be better suited for interior decorators' purposes, we will probably see more of it going into new homes after the war. Its use in this field, however, must be guided carefully by all concerned.

There are many other things we could talk about: germicidal radiation will undoubtedly play an important part in our world of tomorrow; "black light" will find a wider use for many decorative purposes and in our motion picture theatres; and we have learned much during our coastal dimouts that will affect the public's attitude on street lighting. There is no doubt that many of the developments on lamps and devices for war purposes will have an influence on peacetime lamps and lighting. All in all, the consumer has a right to expect more comfortable seeing, a more pleasing environment, and a greater utility from his lighting dollar. These will be brought about as much by our engineering practices as by new and different light sources or equipments. The trends are strongly indicated. What we make of them rests in the hands of the engineers and architects in general, and the lighting industry in particular.

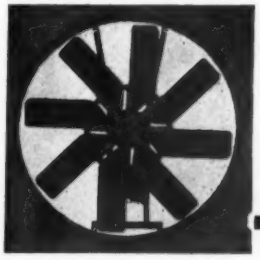
Paint and Soap Help Lighting Efficiency

(*Continued from page 25*)

ed—0 per cent decrease in light output.

This reflector had not been serviced for approximately six months; if the period had been longer, the amount of light being

Coolair
TRADE MARK

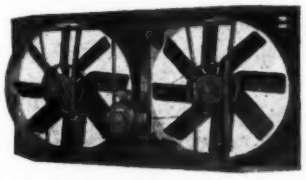


Exhaust FANS and BLOWERS ARE NEEDED in hundreds of MANUFACTURING plants in YOUR territory!

UNDER CMP REGULATION 5 which permits minor capital expenditures on additional equipment and plant improvement, hundreds of manufacturing and processing firms in your territory can now assign their own priority rating to orders for Coolair Fans . . . to properly ventilate and lower temperatures in workrooms and processing spaces in their plants.

Contact the right men in these plants and sell them on Coolair Breeze-Conditioning as the simple and economical way to maintain high employee efficiency during the hot summer months and at the same time help reduce absenteeism by improving working conditions.

If you find that their needs exceed the limit of expenditure authorized by this regulation, help them prepare and file application on Form PD-1A with your nearest WPB Field Office for quick action.



TWIN UNIT FAN: Widely used where limited headroom or vertical wall space does not permit use of adequate sized single unit Coolair Fan.

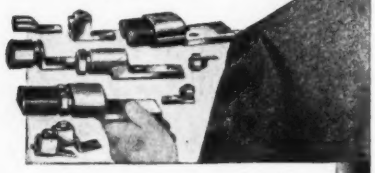
PROMPT SHIPMENT . . . can be made on many types and sizes of Coolair Fans on orders bearing a rating of AA-5 or better.

Call on us if we can be of help in working out difficult problems in ventilating and lowering summer temperatures.

A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in
SWEET'S CATALOG A.S.H.V.E. GUIDE
ELECTRICAL BUYER'S REFERENCE

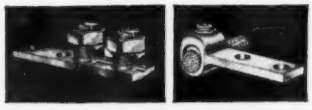
AMERICAN COOLAIR CORPORATION
3604 Mayflower Street Jacksonville, Florida

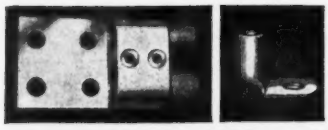
"To get the **RIGHT** lug at every point—

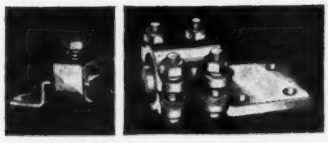


—select your terminals from the **COMPLETE** line"

Look in the Penn-Union Catalog —all of the good types: Solderless lugs to grip the conductor by Bolt, Screw, Post-and-Nut, or Multi-Slit Tapered Sleeve . . . Soldering lugs, Cast and Stamped, in wide variety . . . Here are just a few:







You will also find the most complete line of Cable Taps, Tee Connectors . . . Straight, Parallel, Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Service Connectors.

Penn-Union fittings are preferred because every one is mechanically and electrically *dependable*. They are the first choice of leading utilities, industrials, electrical manufacturers, contractors. *Write for the Penn-Union Catalog.*

L. MORRIS LANDERS
309 Walton Building
ATLANTA, GA.
WALTER J. HUEMMER
Dallas Transfer & Terminal Warehouse Bldg.
DALLAS, TEXAS
PENN-UNION ELECTRIC CORPORATION
ERIE, PA.

PENN-UNION
Conductor Fittings

wasted would have been even larger. Another laboratory test on two high bay reflectors yielded the following results:

(A) Open high bay reflector from average factory area:

(1) As found—42 per cent decrease in light output.

(2) Dry wiped—35 per cent decrease in light output.

(3) Washed clean—0 per cent decrease in light output.

(B) Enclosed dust tight high bay reflector from foundry:

(1) As found—7 per cent decrease in light output.

(2) Dry wiped—5 per cent decrease in light output.

(3) Washed clean—0 per cent decrease in light output.

The length of time since the last cleaning of both A and B above was over a year. The tests not only illustrate how much light may be wasted through neglect but also show two other interesting points. First, it is evident that dry wiping is entirely unsatisfactory for cleaning. The degree of ineffectiveness of dry wiping depends upon the character and oiliness of the dirt and the nature of the reflecting surface, but in no case is it adequate. Secondly, the comparison between A and B proves the economy of dust tight covers in extremely dirty locations, for B was in a much dirtier atmosphere than was A. In any case, whether the dirt be prevented from reaching the reflecting surfaces or whether these surfaces are kept at optimum efficiency by frequent washing, it is obvious that *it pays to keep lighting equipment clean.*

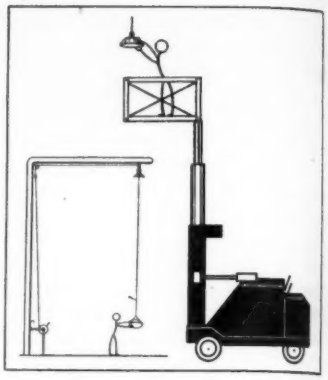
How to Check Industrial Seeing Conditions

(*Continued from page 21*)

faults of poor lighting:

Disconnecting Hangars — The Thompson Disconnecting Hangar made by the Thompson Electric Company, 1101 Power Avenue, Cleveland, Ohio, is widely used for lighting outlets that are difficult to reach in any other manner. The reflector is attached to a chain or cable which permits it to be lowered to the floor for cleaning and relamping.

Telescoping Platform — The Economy Engineering Company, 2653 W. Van Buren Street, Chicago, Illinois and 342 Madison Avenue, New York, N. Y., have manufactured telescoping platforms for



lighting maintenance for a number of years. These are available in a number of sizes and will reach nearly any mounting height. However, for the higher mountings, above 20 ft.) the telescoping platform is equipped with outriggers which firmly brace the platform and reduce the danger of tipping over.

Similar units, brought to our attention, are also made by the Lewis-Shepard Company, Boston, Mass., and the Universal Fittings and Pa. (*Continued on page 86*)

YOU CAN DEPEND ON

Sepco

1915 - 1943

ELECTRIC WATER HEATERS

ALTHOUGH WAR TIME CONSTRUCTED THEY STILL GIVE THEIR USUAL EFFICIENT, ECONOMICAL PERFORMANCE WITH THEIR LONG LIFE LOW WATTS DENSITY HEATING UNIT, THEIR POSITIVE SNAP ACTION THERMOSTAT AND MOST EFFICIENT HEAT INSULATION MANUFACTURED AND GUARANTEED BY

AUTOMATIC ELECTRIC HEATER CO.
POTTSTOWN, PENNA.

NEW Revere

9-S-5452 NAVY STANDARD
BUILT TO NAVY SPECIFICATIONS
500 WATT

Rugged design to withstand concussion and vibration.

•

Weather-proof, Sure-tight hinged door.

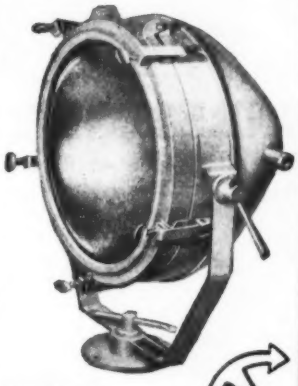
•

Highly efficient—requiring minimum of maintenance.

•

Ideal for any location where controlled light sources are needed.

Write for full particulars.



FLOODLIGHTS and SEARCHLIGHTS
for EVERY PURPOSE

REVERE ELECTRIC MFG. CO.
2939 NORTH PAULINA STREET · CHICAGO
Originators of the Hinged Floodlight Pole
INDOOR and OUTDOOR LIGHTING EQUIPMENT of EVERY DESCRIPTION

One "Quickie" Salvage Job Isn't Enough . . .

YOU'VE JUST BEGUN TO SCRAP

"Once over lightly" doesn't even *begin* to turn up the full scrap potential of the average industrial plant. Tremendous quantities have been either neglected or overlooked.

It's amazing what the second and third time around will yield when everybody is convinced that you mean business. Out they come—hidden tons of ancient parts and fittings, useless dies and jigs, everything from cotter pins to drill presses!

Use It—Sell It—or Scrap It!

Maybe you can't use some good machinery — yet it hasn't reached the scrap stage. Okay — sell it. Usually somebody else is looking for that equipment. You'll get prices far better than those for scrap. And you'll do your Uncle Sam a good turn into the bargain.

How to Sell Your Scrap

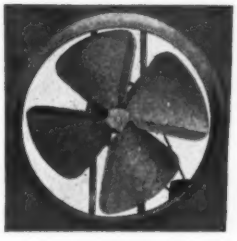
If you have no regular scrap dealer, find one in the classified phone book. He'll buy usable materials, too; or you can find a Used Equipment Dealer in the same place.

Don't expect your scrap heap to be a gold mine the dealer works under a price ceiling, the same as you do. But you will find there's a million dollar feeling in the knowledge that you're doing your part all the way. It's 100% better than the guilty sensation you get every time you pass some good metal you should have scrapped months ago!

BUSINESS PRESS INDUSTRIAL
SCRAP COMMITTEE
Room 1261, 50 Rockefeller Plaza, N. Y. C.

If you have done a successful salvage job at your plant, send details and pictures to this magazine. Send for booklet — "Primer of Industrial Scrap."

THE "Fresh-Air MAKER"



provides fully the comfort and ventilation so essential in army barracks, mess halls, hospitals, headquarters, theaters and other military buildings. Its fine design and sound construction meet the specifications drawn for army fans and it is particularly adaptable to the various types of installations found in army buildings.

HY-DUTY BLOWERS

Single Inlet—Double Inlet. 400 CFM to 12,500 CFM.

Single Inlet Blower illustrated at left is particularly adapted for ventilation of mess halls in military establishments.

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UNRESTRICTED

Meet All Government Requirements!

Solder joints are prohibited by government order wherever another product meeting electrical requirements can be used—but IDEAL "Wire-Nuts" are not prohibited. "Wire-Nuts" fill the bill 100%. They use none of the critical materials—tin, lead, or rubber—required for solder and tape joints. Make a neater, safer joint; Better Electrically — Stronger Mechanically. Fully Approved. Listed by Underwriters' Laboratories, Inc. Sizes for every job. Write for free samples.

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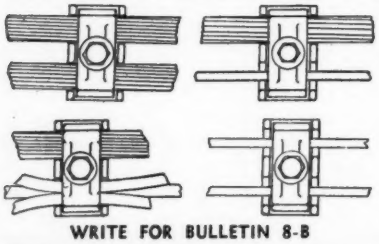
Sales Offices in all Principal Cities

is no better than its

Universal Tap Connector

Effectively used as guy line ground, or transformer and lightning arrester connection to A. C. S. R. or copperweld conductors where the diameters may be from 8-A copperweld to .595" A. C. S. R. armour rods. Wire sizes .595" to 5/32".

ADAPTABLE TO A WIDE RANGE OF USES



WRITE FOR BULLETIN 8-B

K&H KRUEGER & HUDEPOHL

Solderless Terminal Lugs and Connectors

VINE AT THIRD ES • CINCINNATI, OHIO

Portable Maintenance Platform —The Safeway Steel Scaffolding Company, Milaukee, Wisconsin, manufacture a number of platforms which can be used for lighting maintenance. These can be used particularly where all of the reflectors are at the same mounting height, or nearly enough the same mounting height, that one platform takes care of the entire installation.

Stepladders Especially Designed for Maintenance — The Ultramar Manufacturing Company, 303 W. Monroe Street, Chicago, Illinois, manufacture a stepladder equipped with wheels and bin for carrying lamps, fluorescent lamp starter switches, cloths, and other necessary materials. This type of equipment is especially useful for lighting maintenance of relatively low equipment. There are two models, one six foot high and the other eight foot high, in standard production, and larger models can be obtained on special order. This is a very convenient and useful device for relatively low mounting heights.

Cleaning Materials — Several manufacturers of soap and detergents have brought their publications to our attention, dealing with cleaning materials which can be adapted for lighting maintenance.

Soap Buying Guide, The Colgate-Palmolive-Peet Company, 105 Hudson St., Jersey City, N. J.

Simplified Cleaning, A description of Wyandotte Products put out by the J. B. Ford Sales Company, Wyandotte, Michigan.

The Oakite News Service, Put out by Oakite Products Inc., 22 Thames Street, New York, N. Y. This is a bi-monthly publication and deals with all phases of cleaning. The September-October, 1942 issue, carried an article, "Lighting the Way to Higher Production," which discusses particularly the need for adequate lighting maintenance.

The above list is by no means all-inclusive but merely represents those which have been brought specially to our attention.

As a further suggestion, we are listing a few of the cleaning methods for different types of reflecting surfaces found satisfactory from past experiences:

(1) Alzak Aluminum — General Electric Cleaner Type D50-RI, No. 90XI.

(2) Porcelain or Baked Enamel —soap and water, Oakite green soap, alcohol and water; wetting compounds like Windex — do not spill on machines and stock—clean thoroughly. No experience with such materials on heavy oily dirt.

Particularly at this time do all industrial plants, engaged either partially or completely in war work, need more and better light to speed work, avoid waste, and reduce accidents. It is a well known fact that today's war factories must produce more and more goods, of better quality, and at greater speed than ever before. With limited time for new buildings and labor difficult to get, the alternative is to get more, better, and faster production from existing equipment.

It is a well known fact that many workmen seemingly perform a very efficient job under poor lighting. However, it's only reasonable to explain such cases by stating that they do good work *in spite* of the poor lighting, and not *because* of it. Consider how much better their performance might have been under adequate, comfortable lighting. By and large, once a management decision is made, good lighting is something that can be ordered, corrected or properly maintained today, in effect, put in tomorrow. Its effect on increased production of all workers is immediate.

Subox

ANTI-CORROSIVE PAINTS

ARE AVAILABLE FOR

MAINTENANCE
SALVAGE
CAMOUFLAGE

Subox, Inc.

NORTH ARLINGTON, N. J.

Electric Motors

1000 FAN DUTY — 1/20 H.P.
1500 General Purpose — Various Type
24" and 30" Air Circulator Propeller
with Wire Safety Guards.

Immediate Delivery

(We purchase surplus stocks of Motors and Fan Blades for Cash)

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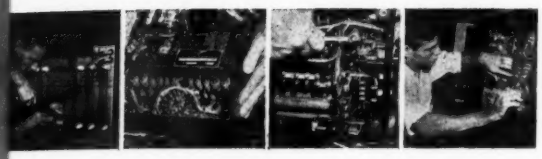

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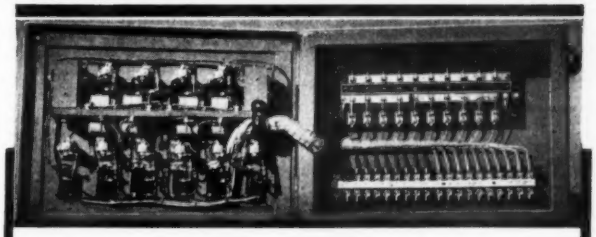

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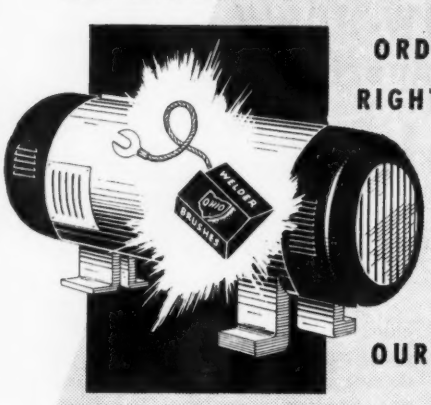

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